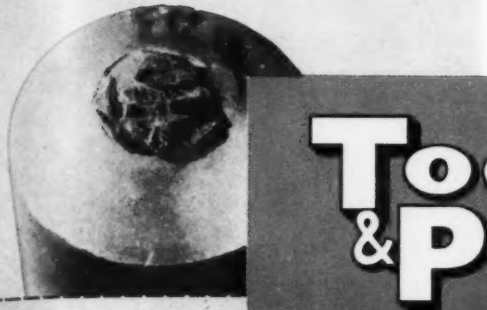
FEBRUARY 1958



TOOLING & PRODUCTION Magazine

used diamond trueing tools (top three) and their ured, burned diamonds, as compared with a rly used tool. More on diamonds on page 67.

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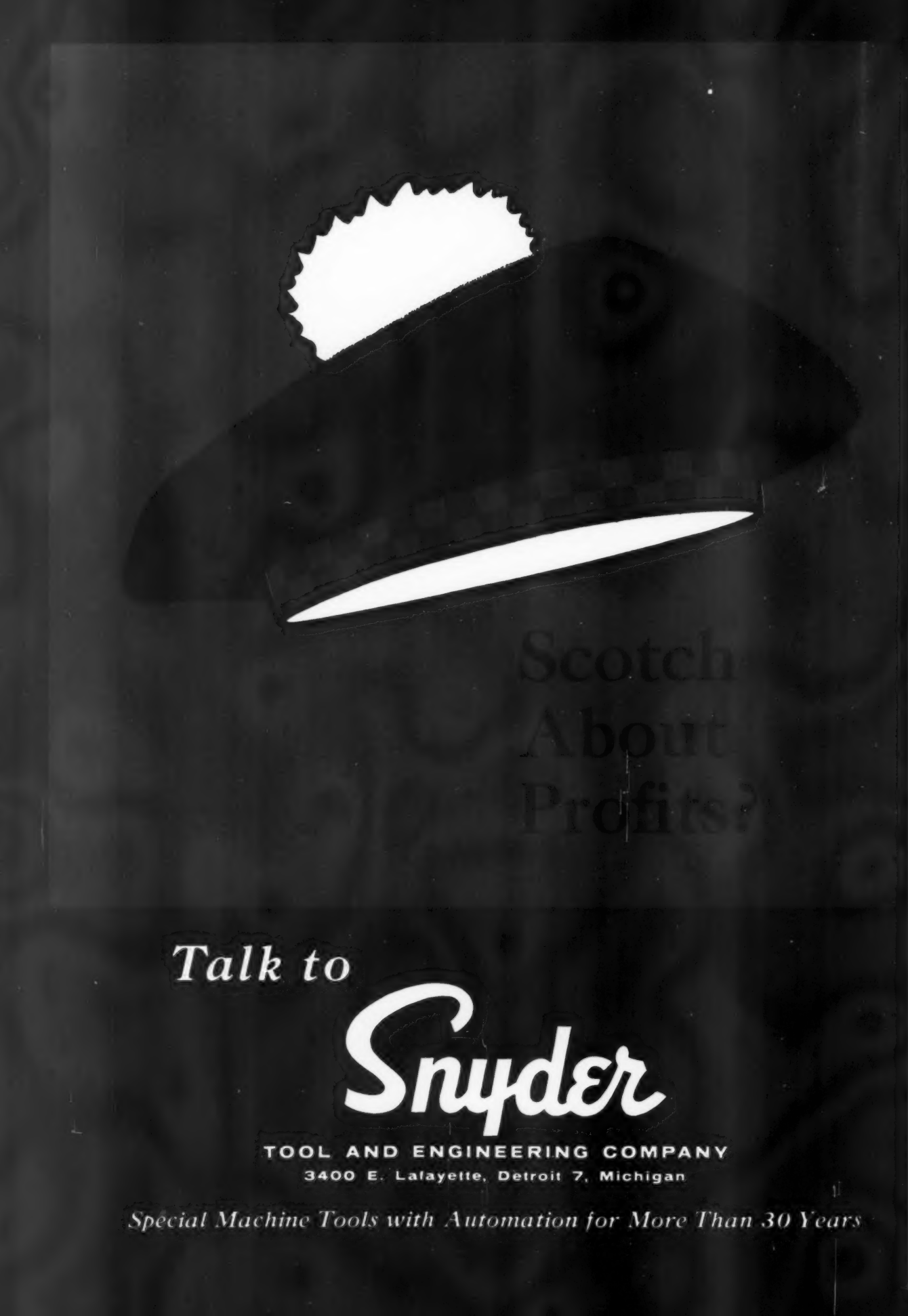
Scotch
About
Profits?
Talk to
Snyder
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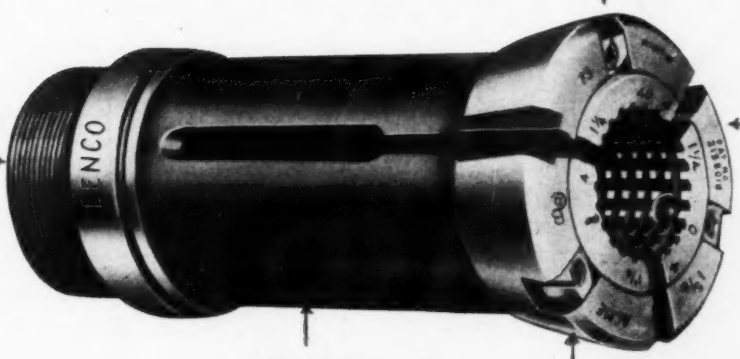
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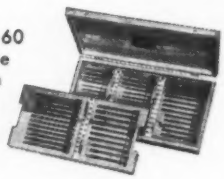

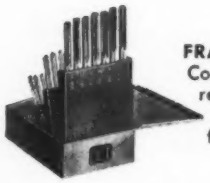

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TOOLING & PRODUCTION Magazine

FEBRUARY 1958
VOL. XXIII—No. 11
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T&P Reader:

In spite of the recent down curve in business volume, many prognosticators and economic experts are forecasting continuing growth in our economy with the rate of growth accelerating rapidly starting in 1960, simultaneously with a sharp increase in the birth rate. It would appear, then, that a slackening of the business pace this year might well be a blessing in disguise.

This might be especially true for smaller business enterprises which find it difficult to have an expert for everything that requires "experting". After all, the smaller business or plant is beset with present day complications proportionately just as much as the big company.

This year, then, might be considered a "breather" and that is good if it is advantageously used. It can be a time for revitalizing an organization, personnelwise. It may well be a good time to plan some plant expansion, because such may be much more feasible and economical during 1958 due to the fact that industrial construction is expected to be down and at a time when money promises to be easier. Also, 1958 will be opportune for modernizing standard production machinery and equipment. We hear that there is no seller's market in 1958 for machine tools. It must then be a buyer's market. So it ought to be an advantageous time to buy.

In other words, it looks to us like, while early 1957 was a time to sell "high", 1958 in many respects promises to be a time to buy "low". We hope that you can at least turn 1958 into a year of immense and satisfying progress, if you can't make it your most profitable year.

Cordially yours,

Ray Huebner

Publisher

TOOLING & PRODUCTION

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Editorial and Business Offices: 1975 Lee Road, Cleveland 18, Ohio, FAirmount 1-4040
Printing Office: 112 E. Chestnut Street, Louisville 2, Ky. (For Plate Shipments Only)

Published Monthly by HUEBNER PUBLICATIONS, INC.
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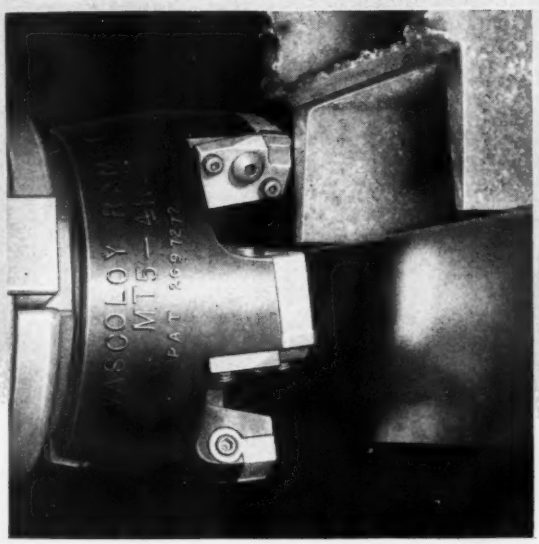

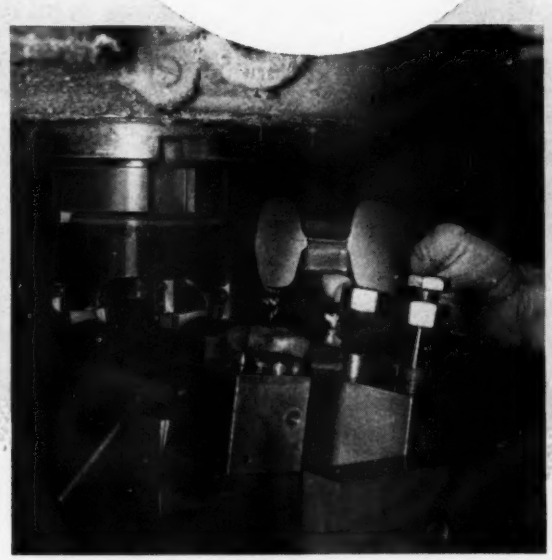

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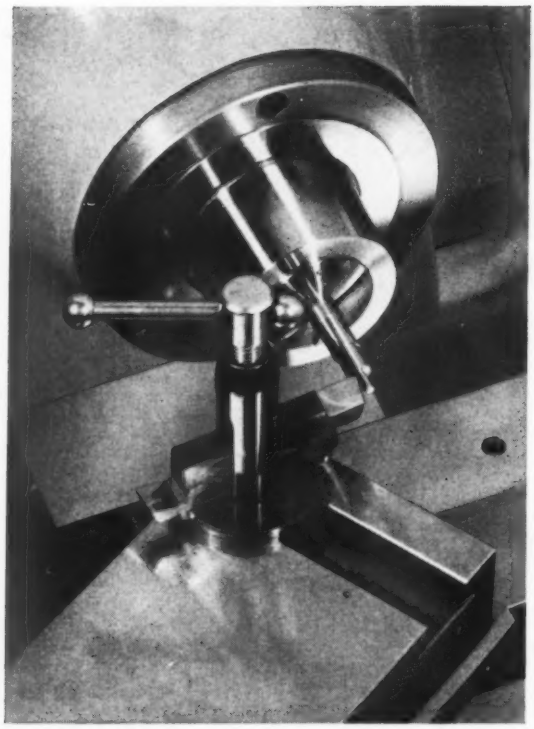

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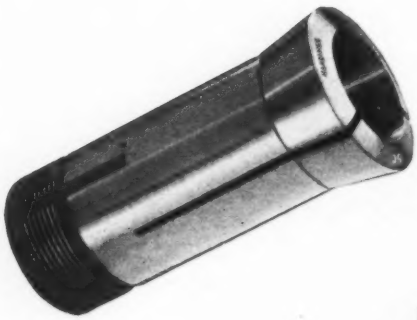

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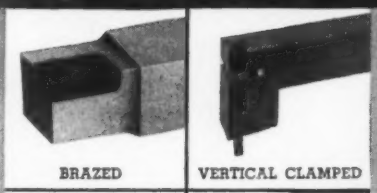
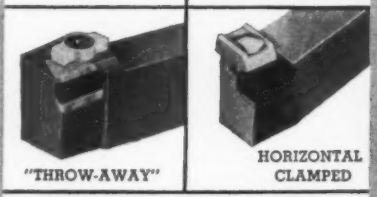
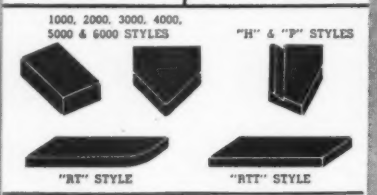
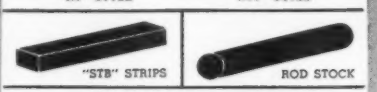
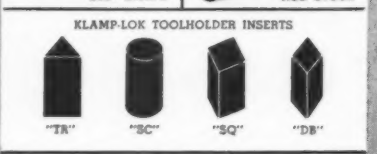
Caterpillar REG. U.S. PAT. OFF. Tractor Co. gets results . . . with Talide S-92

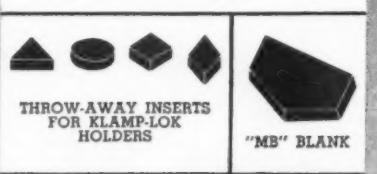


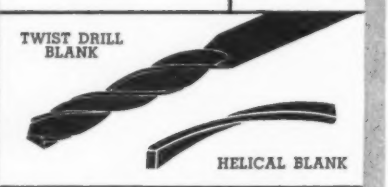


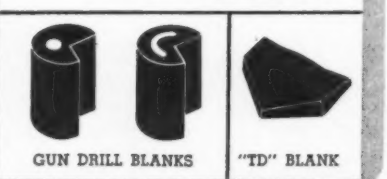


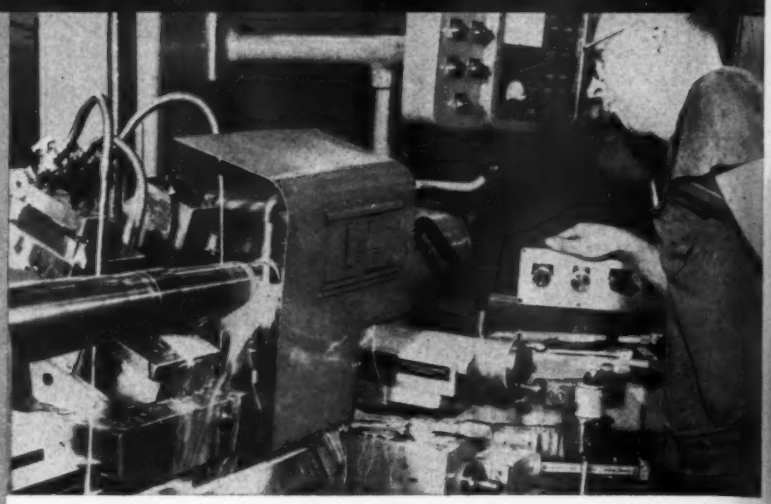




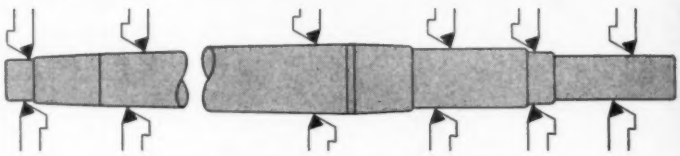








Caterpillar REG. U.S. PAT. OFF. Tractor Co., leading producer of tractors, diesel engines, motor graders and earthmoving equipment, has been using cost-cutting TALIDE tools for over 10 years to produce parts. Typical example of savings obtained is illustrated below:



CRAWLER TRACTOR AXLE SHAFT

Part . . . . . Crawler Tractor Axle Shaft

Material . . . . . SAE 8645 Steel Forging 3¼" dia. x 38½" long, 3.6mm Brinell Hardness.

Operation . . . . Rough turn all diameters, form tapers, shoulders, and steps.

Machine . . . . . Monarch Mona-Matic No. 21 Tracer Lather, size 54".

Tools . . . . . 12 Talide TB-164 ½" I.C. Triangular TALIDE Throw-Away Inserts mounted in Klamp-Lok Toolholders, Grade S-92.

Depth of Cut . . ⅜"

Feed . . . . . 6" per min.—.018 F.P.R.

Speed . . . . . S.F.M. 387—R.P.M. 340

Coolant . . . . . Soluble Oil and Water

Results . . . . . TALIDE Grade S-92 turned 7 shafts per corner per grind for total of 42 shafts per grind. Inserts were ground an average of 6 times and produced a total of 294 shafts over life of insert. Next best premium carbide grade produced 235 shafts.

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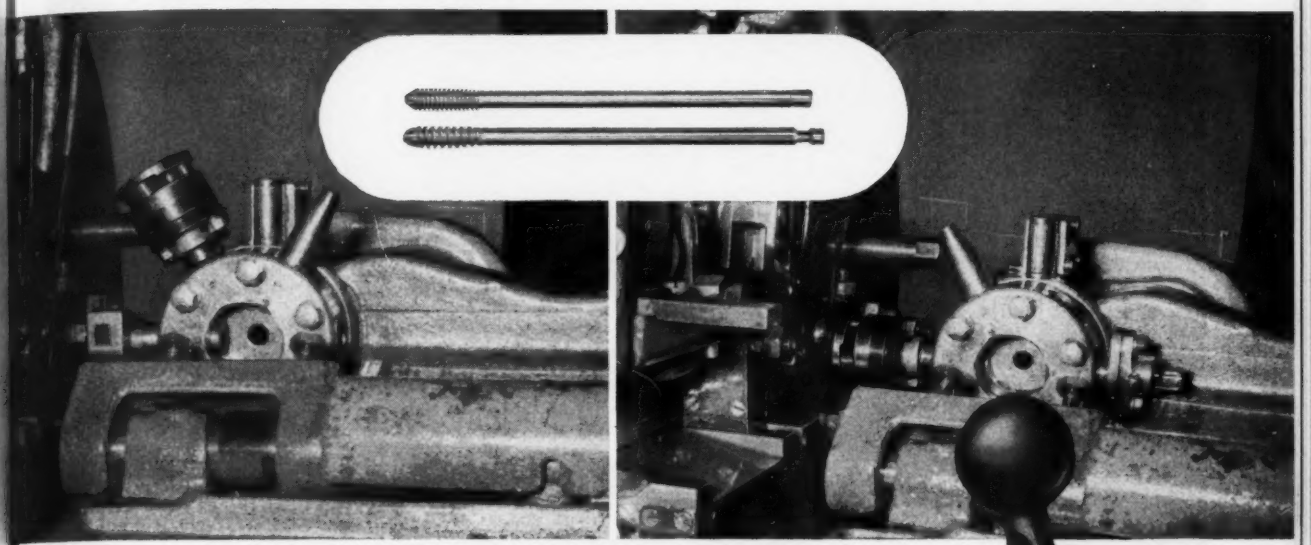
and eliminates costly secondary machining operation



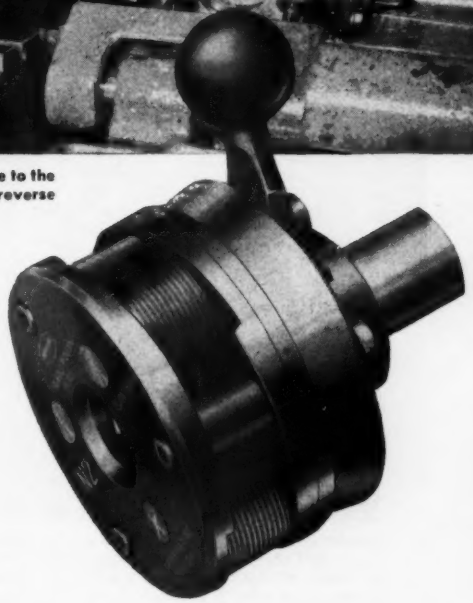
In this setup, on a Brown & Sharpe automatic, down time was reduced to a minimum, due to the fact that it was possible to thread more than 500,000 pieces before it was necessary to reverse the rolls—a distinctive Acme-Fette feature which doubles the life of threading rolls.

ROLLS THREADS . . . faster and better

WITH NEW ROTATING — NON-ROTATING

Acme-FETTE

THREAD ROLLING HEAD AND ROLLS



With an Acme-Fette THREAD ROLLING HEAD in the primary setup, Westinghouse completed these electric appliance terminals without a secondary machining operation. Time saved in rehandling alone more than equalled the cost of the head and rolls.

Acme-Fette Thread Rolling Heads are available in 8 sizes, in capacities from 1/16″ to 2″, at only a fraction of the cost of specialized equipment. The same head can be used in both rotating and non-rotating spindle machines—either horizontal or vertical.

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- **Rolls threads up to 5 times faster than—and without chip problems associated with—thread cutting.**
- **Provides smoother threads, of consistently closer tolerance, with greater tensile strength—and without cratering at the thread crest.**

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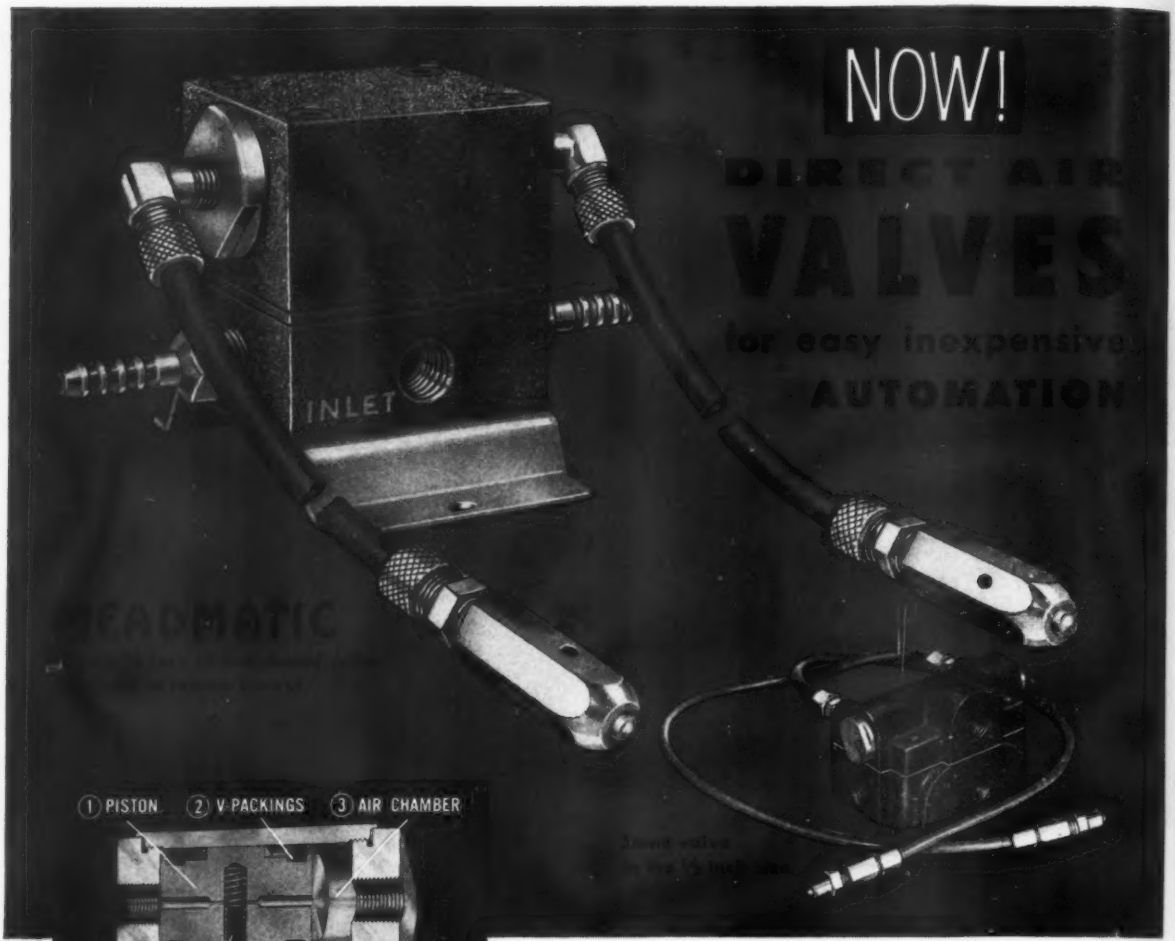

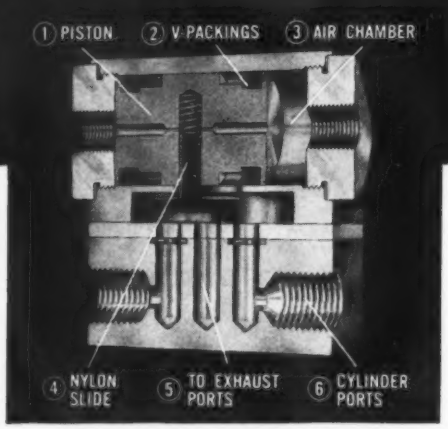

Diagram shows air flowing to one side of a double acting cylinder from outlet 6 while being exhausted through hole 5 on other side of cylinder. When the right poppet is touched, air is bled from chamber 3 and piston(1) is shifted to right. At this point, air is exhausted through port 6 as air enters opposite side of cylinder.

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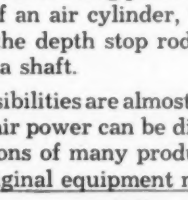

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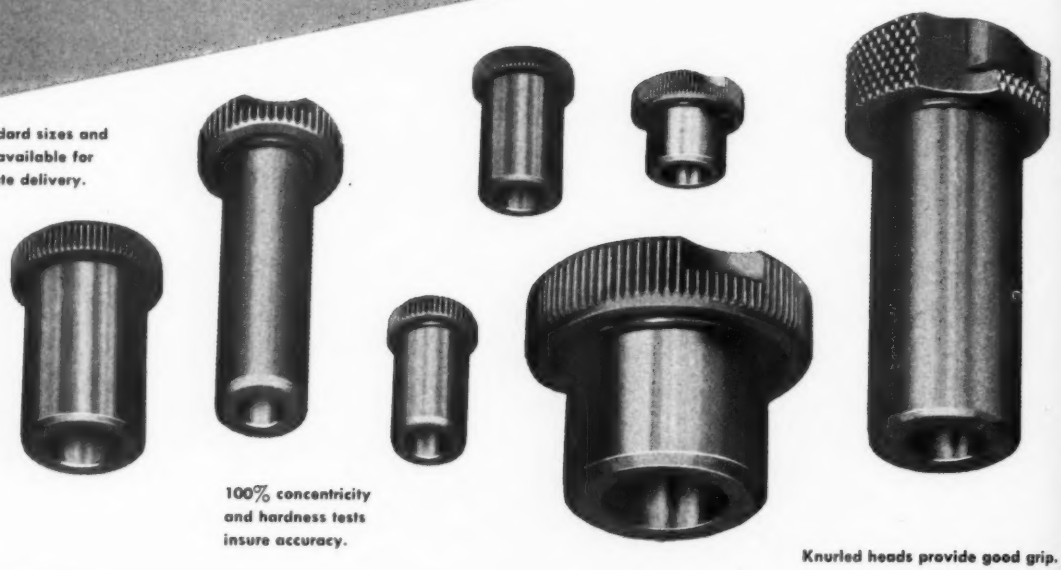
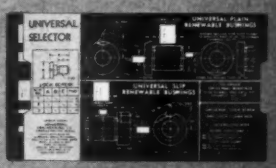


100% concentricity and hardness tests insure accuracy.

Knurled heads provide good grip.

Write for free catalog describing Standard Drill Bushings, Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, Kwik-Switch Tool Holders, Mikro-Lok Boring Bars, Indax Plungers and other Universal Products.



The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size. Request your calculator—free—on your company letterhead.

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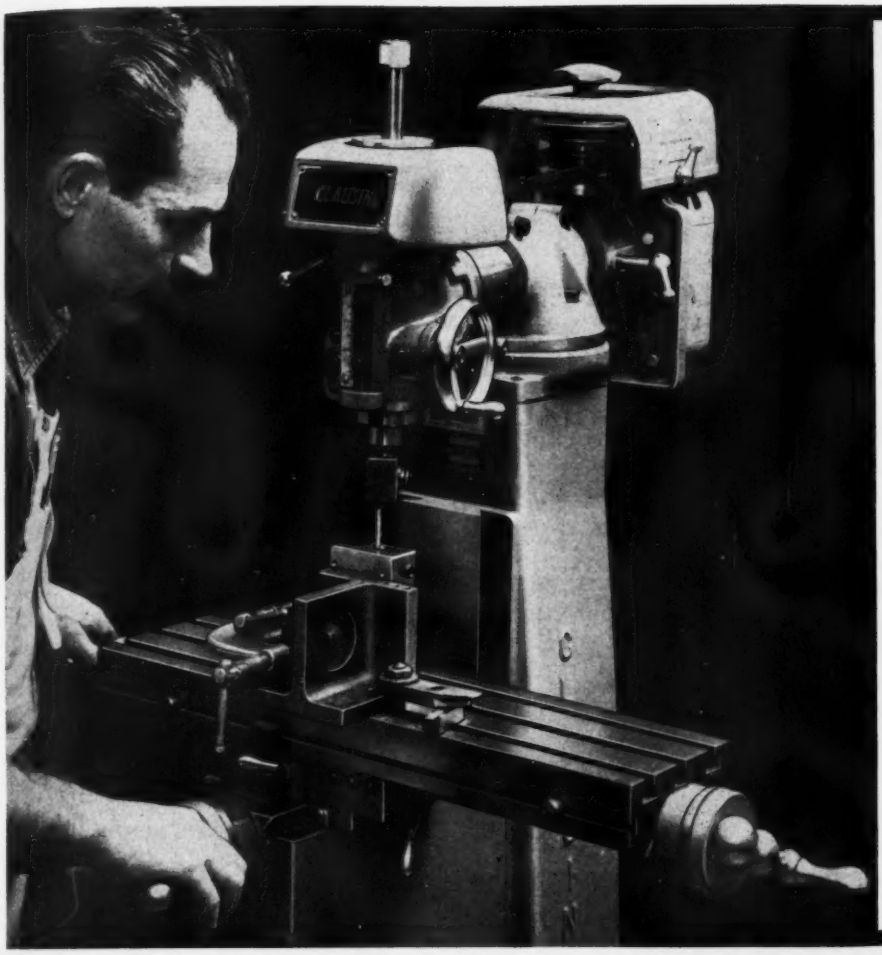
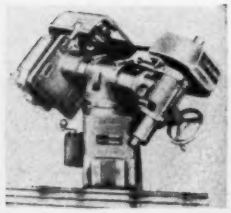
UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 12



The high precision spindle and drive have 7 ball bearings . . . hardened spindle. Ground and hard chrome plated quill has full length bearing in head.



The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to machine at all angles with one set-up.

HERE'S PROOF OF PERFORMANCE . . .

"The Clausing Vertical Miller is the best machine for the money on the market today! It is most versatile . . . and extremely accurate". — F. L. BALLENTINE, EMPIRE TOOL ENGINEERING COMPANY, INC.

VERIFIED ACCURACY — Before it leaves the factory each CLAUSING Mill must pass rigid tolerance tests such as:

1. Top of table perpendicular to column ways within .0005" in 6" travel.
2. T-slots square with cross slide dovetails within .0005".
3. Table, parallel to turret within .001".
4. Spindle square with table, front to rear, within .001" T.I.R. in 5" circle.
5. Spindle taper (internal) run out within .0002" at spindle nose.
6. Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

This report is typical of the experience of users everywhere. The CLAUSING VERTICAL MILLER is a precision machine tool designed for operations where "extremely accurate" machining is required. And, it is an outstanding producer, "most versatile, easiest to set up, get around and operate of *any* miller at or near its low price." Only $850 f.o.b. factory.

MILLS, DRILLS, BORES, REAMS, SHAPES AT ALL ANGLES . . . WITH ONE WORK SET-UP!

Write FOR FREE LITERATURE

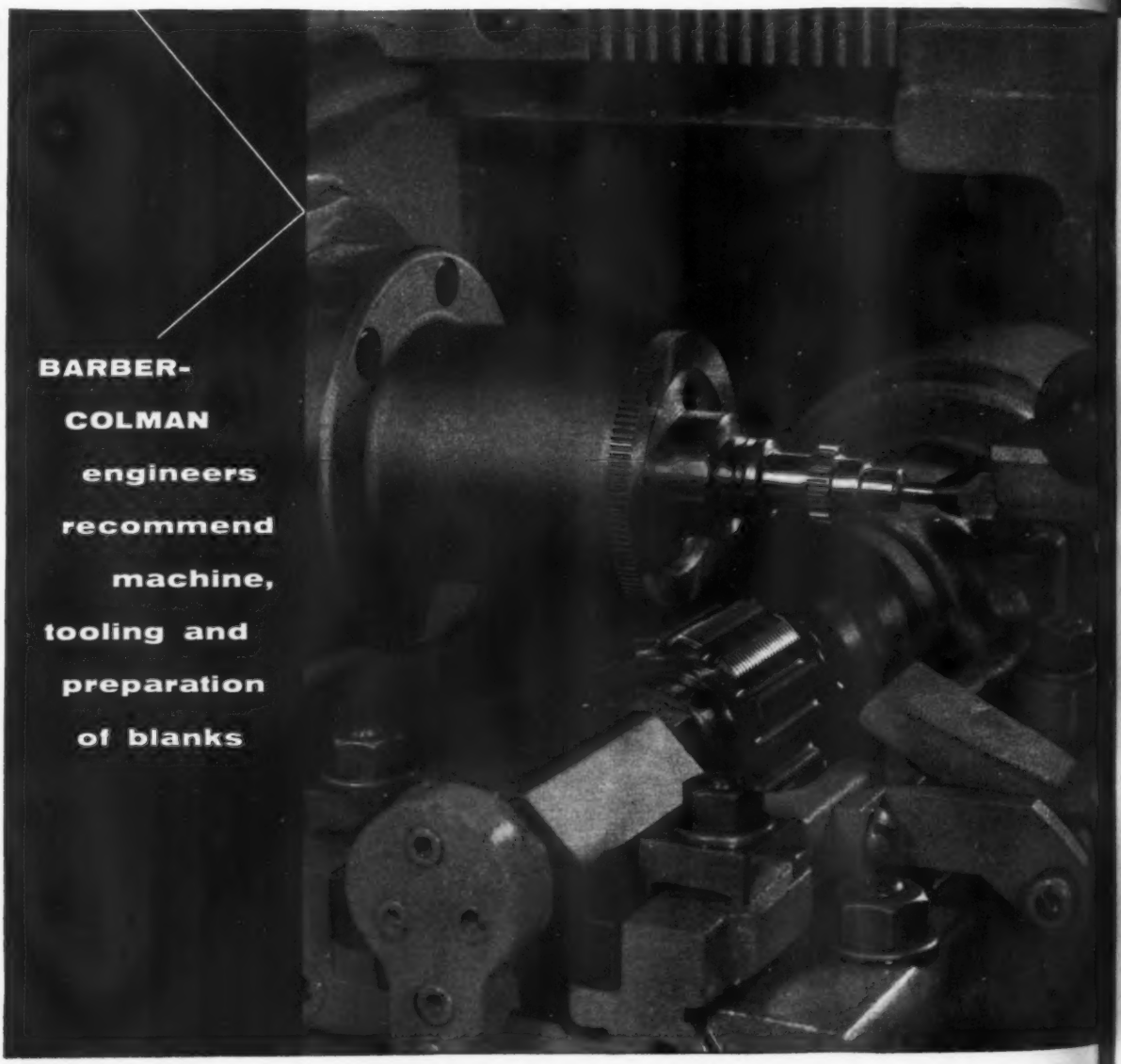
Atlas CLAUSING PRECISION MACHINE TOOLS — DIVISION ATLAS PRESS COMPANY

CLAUSING DIVISION • ATLAS PRESS COMPANY

2-115 N. PITCHER ST., KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 13

GUARANTEED ACCURACY
with standard-type precision
hobbing machines



The Kearney and Trecker Corporation have designed a servo-control mechanism for controlling an airframe section profile and contour milling machine. The extreme accuracy required for the transfer of motion in this mechanism demanded a whole new approach to the production of gears at Kearney and Trecker.

Barber-Colman Engineers were consulted for their suggestions to assure gear accuracy for this program. They recommended a standard-type No. 6-10 Precision Hobbing Machine and designed special tooling for each of the eight gears in the mechanism. They also specified the preparation of the blanks for hobbing.

This machine is guaranteed to cut a 4″ diameter spur gear within .0002″ adjacent and .0004″ non-adjacent spacing error checked on an optical dividing head. The blanks are ground on the diameter and sides, holding the diameter, parallelism and radial and axial runout within .0001″. Two holes are provided for driving the gear during hobbing.

These photographs show one of the gears in the train and the special tooling designed for it. The blanks are located between centers and are driven by a diamond-shaped pin in the backing plate. For hobbing this 48 D.P., 115 tooth gear, a feed of .010″ is used, and the hob speed is 183 R.P.M. The material is stress-proof steel R.C. 27. Barber-Colman Class AA taper-bore hobs are used and resharpened to original hob accuracy on a Barber-Colman No. 6-5 Hob Sharpening Machine.

With this equipment and recommended procedure, all gears in the train are hobbed well within Precision Class 2 AGMA tolerances. The success of this program is indicated by the results obtained on the example shown. Inspection shows these gears are consistently within .0002″ tooth-to-tooth and .0004″ total composite error.

Accuracy of this degree is not unusual with Barber-Colman machines and hobs. This case shows the results which can be obtained by working closely with, and following the recommendations of, experienced hobbing technicians. When you have applications requiring accurate gears, consult Barber-Colman hobbing experts for their recommendations.

BARBER-COLMAN COMPANY

6102 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

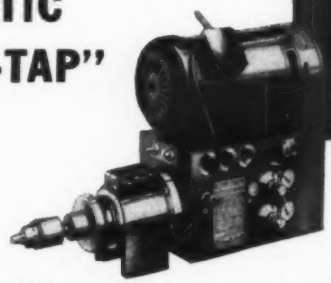
BARBER COLMAN

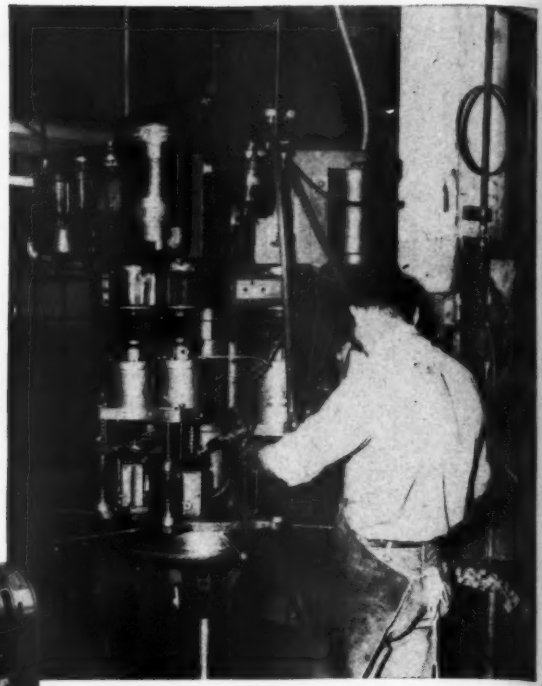
CIRCLE INFORM-A-GRAM KEY NO. 15

Here's How A Mower Manufacturer . . .

drills, taps, spotfaces 400% FASTER

with DUMORE series 28 AUTOMATIC "DRILL-N-TAP" UNITS





JACOBSEN MFG. CO. combines readily available Standard Dumore Components with simple fixturing and indexing to quickly build this special-purpose machine for faster, lower cost production on brass connecting rods.

5 Dumore "Drill-N-Tap" Units, mounted on a Dumore Drill Press Stand, serve as driving heads. Two holes are drilled, then spotfaced using the multiple head. An angle hole, then a center hole are drilled. Next, two holes are tapped on the multiple head. A simple hand indexing ring moves the set-up to each station. Previous methods produced only 75 pieces per hour with one man using three different machines in sequence. Now, one man produces 350 pieces per hour — nearly 400% faster!

In addition, Jacobsen can use these Dumore Units for other work. They are merely detached, by the simple nose mounting devices, and carried to new set-ups . . . storing the original set-up until needed again.

THE DUMORE SERIES 28 "DRILL-N-TAP" UNIT drills or taps at the flip of a switch. Tap fits into chuck, no extra head required. Reversing motor removes tap, eliminates expensive clutches. Spindle speeds 265 to 4900 rpm. For long or short runs. Mounts in 3 minutes — anywhere, with simple nose bracket. Available as complete Drilling and Tapping Press with fixture, press and "Drill-N-Tap" Unit, or, "Drill-N-Tap" Unit supplied with bracket to convert your 14" x 17" drill press into a completely automatic drilling and tapping machine.

YOU CAN SAVE HUNDREDS OF DOLLARS IN FIRST COST ALONE WITH THESE DUMORE AUTOMATIC DRILL UNITS . . . *Series 24* — Fully automatic with all controls built-in. Preselected speeds, feeds, depth. Ideal for varying runs and frequent changeovers . . . *Series 26* — Same as Series 24 with just *basic* controls for long, uninterrupted runs.

Get A Demonstration Now . . . See Your Distributor, or Write

DUMORE PRECISION TOOLS

AUTOMATIC DRILL and TAP UNITS
PORTABLE MILLING UNITS
MICRO-DRILLS
TOOL POST and HAND GRINDERS

Made by the makers of the *famous, universally used* DUMORE TOOL POST GRINDER

THE DUMORE COMPANY • 1304 - Seventeenth Street • Racine, Wisconsin

DUMORE DRILL GRINDER SERIES 21

For fast, accurate sharpening of all 2-lip twist drills (including crankshaft) from No. 70 to ½". Grinds included angles from 90° to 150°, clearance angles from 5° to 15°. Cuts volume drill costs.

DUMORE AUTOMATIC DRILL HEADS SERIES 20

For high production drilling of small parts. Eliminates drill breakage. Automatic built-in controls. No. 80 to 5/32" capacity.

DUMORE MICRO-DRILLS SERIES 27

Drills small holes to .001" without specially trained operators. Super-sensitive feed. Accurate and instant-centering magnetic chuck. Micrometer depth control. Speed control box. Two models.

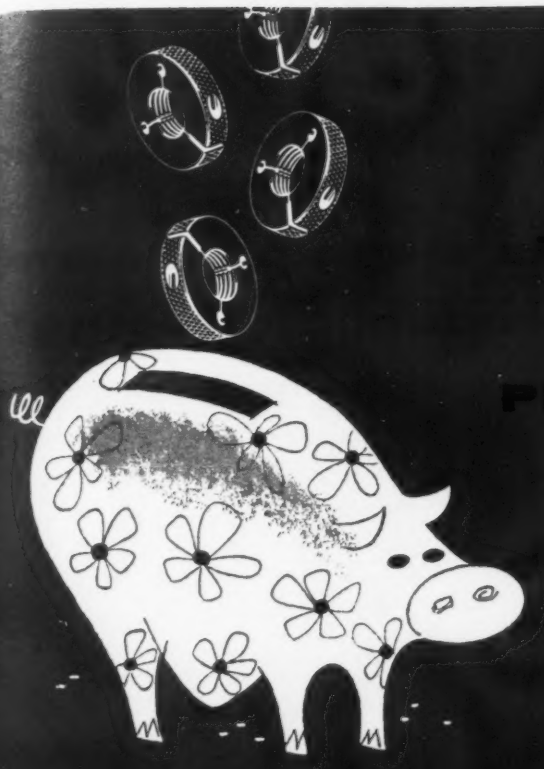
DUMORE DRILL PRESS STANDS AND BRACKETS

Circular or rectangular table fixture press. Includes base, column, table, 2 clamps and bracket. Use with Dumore Units for versatile, automatic machining.

Provide mounting for Dumore Units on your 14" x 17" drill press stands.

FOR MORE INFORMATION ON THESE PRECISION TOOLS—WRITE FOR CATALOG

CIRCLE INFORM-A-GRAM KEY NO. 16



You Can Bank on PIPE MACHINERY Hilo Set Plugs for 4-Way Savings

Now, your thread ring gages or other adjustable instruments for the inspection of male threaded parts can be checked with amazing speed. Pipe Machinery Hilo Thread Setting Plug Gages are designed with two different diameters having identical lead and angles. The smaller diameter is made to the extreme low limit of the tolerance indicated—the larger diameter to the extreme high limit. If the front or low limit end enters, and the back or high limit end stays out, the ring is the proper size. It's just that simple—just that fast!

You no longer need rely on the human element—on the individual operator's sense of feel. With Hilo Set Plugs there's no guesswork, no cause for debate or argument as to what constitutes a snug fit or acceptable shake.

With these revolutionary plugs you utilize all the wear life built into your adjustable gages—never discard them unnecessarily. You reject them instantly and positively when the ring is out of limits.

Last, but not least, reduction in costly inspection time, plus elimination of wasteful scrappage can add up to important dollar savings, too.

Why not put 4-way Hilo Plug savings into your assembly operation? Write today for additional information or stop in and see us next time you're in the vicinity. We'd be proud to introduce you to our team of craftsmen.

THE PIPE MACHINERY COMPANY

29100 Lakeland Blvd. • Wickliffe, Ohio

Greater Cleveland

CIRCLE INFORM-A-GRAM KEY NO. 17

You get

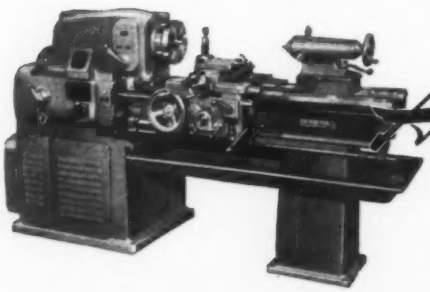
top value per dollar

with a Hendey No. 2E Lathe

timesaving controls step up efficiency of toolroom or production turning!

Because all controls were designed with the operator in mind, the Hendey No. 2-E general-purpose lathe today is setting new standards of efficiency on both toolroom and production jobs. Two outstanding features are the electronic drive that permits infinitely variable speed control, and the instantaneous dynamic brake for rapid stopping and reversing of the spindle.

Here are more Hendey "top-value" features you'll want to check further: quick-change gearbox providing 48 changes of threads without changing gears; thread-chasing dial for returning carriage to the same thread groove; quick-change gearbox for 48 changes of feed without gear change; pushbutton energizing of main motor; and *two* control levers, permitting operator to start, stop, or reverse the spindle from any working position. Contact your nearby Hendey dealer for complete details and specifications.



for precision with production, buy Hendey

Hendey machine division

BARBER-COLMAN COMPANY

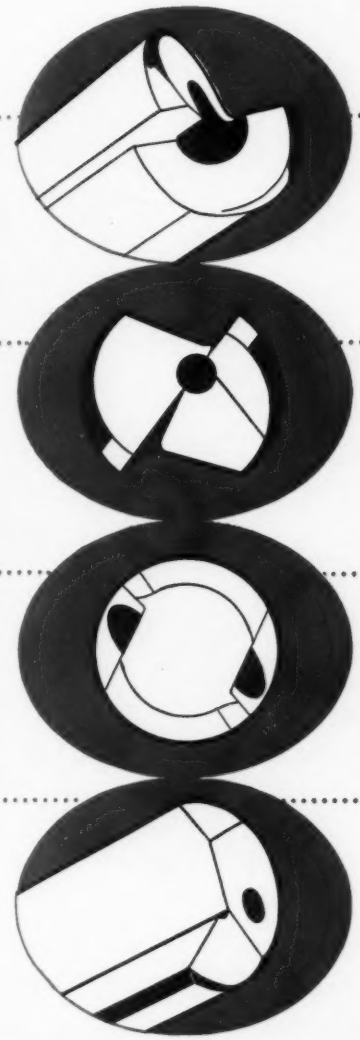
27 Loomis St., Rockford, Illinois

BARBER COLMAN

CIRCLE INFORM-A-GRAM KEY NO. 18

NOW... THE ONLY COMPLETE LINE OF GUN DRILLING TOOLS

Enables you to specify an application-engineered carbide gun drill or gun reamer to suit your particular production, material and finish requirement. Every tool in the precision Star line has been wear-life proven in quantity runs on production parts in both the Star Cutter gun drill development laboratory and metal-working plants.

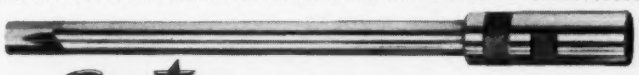


® Starbore DRILL

Has the exclusive trepanning action. Produces precision through-holes from the solid in cast iron, bronze, aluminum and some stainless steel parts. Two-flute carbide design.

Starbore CENTER-CUT DRILL

Produces no pin. For precision blind holes, holes that intersect cross holes, and applications where a pin is not desirable. Two-flute carbide design.



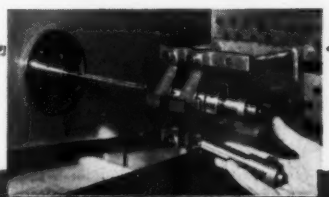
Starbore REAMER

A gun reamer that provides the ultimate in finish and wear life. For enlarging previously drilled or cored holes to finish size in one operation. Two-flute carbide design.

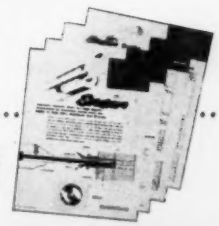
Star GUN DRILL

A gun drill of conventional design for drilling precision holes from the solid in steel. Made in sizes from 3/16-in. to 1½-in. diameter. Single flute carbide design.

Starbore Gun Drilling Services . . . Automated setups for large production runs. Quick-change fixtures for job-lot work. Send blueprints for prompt quotations.



Write for this catalog file giving complete information on Starbore gun drilling tools.



Star Cutter Company

Originators of Accurate Ungrounded Gun Drills

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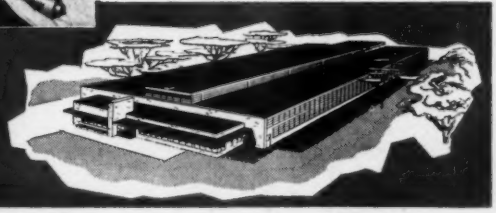
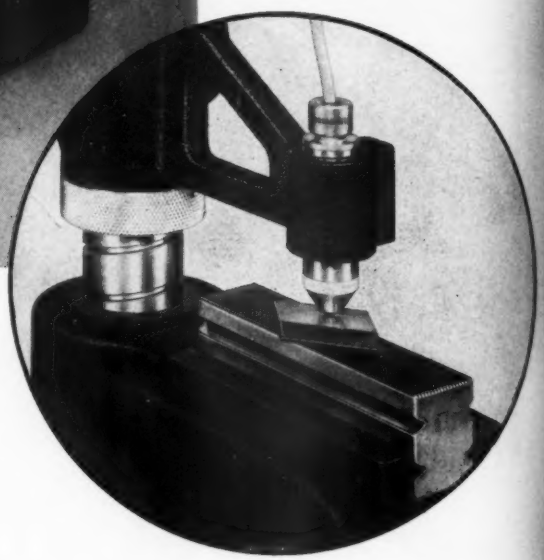
Telephone: (Detroit), KEnwood 3-4500



CIRCLE INFORM-A-GRAM KEY NO. 19

NOW! ON-THE-JOB GAGING with ACCURACY TO .00002"



THREADWELL DUAL RANGE S. I. ELECTRONIC COMPARATOR

New portable unit for on-the-job gaging and comparing now available from Threadwell at an amazing low price. Only the Threadwell S.I. Electronic Comparator has all these features:

- Two ranges selected by a simple turn of the control knob
- Coarse range 200:1, fine range 2000:1
- Lifetime steel tipped gaging unit
- Perfect repetition not found in units costing much more
- Operating pressure of less than 3 ounces
- Work is slid under the gaging head tip
- No sensitivity to temperature change; allows use in any part of plant or shop
- Interchangeable tips for various applications
- Flexible zero adjustment on the most sensitive range. Gaging head can be set up in a simple split clamp without need for fine mechanical adjustment.

Threadwell

THREADWELL TAP & DIE COMPANY
Greenfield, Mass., U.S.A.

Write now for complete information on this amazing instrument or see your Threadwell Distributor.

CIRCLE INFORM-A-GRAM KEY NO. 20

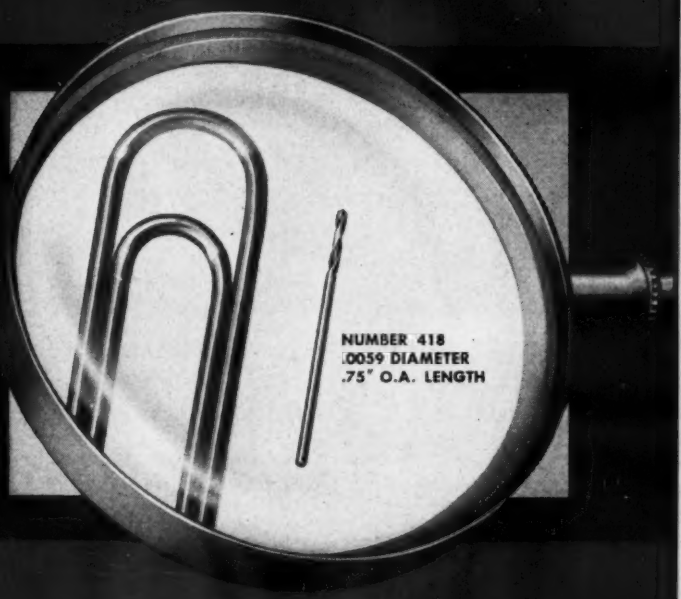
5790 Sizes and types of W&B standard drills cut the need for costly "specials"

Quality-wise . . . variety-wise, Whitman & Barnes' standard drill line is unequalled in the industry! It provides:

- Specific drill designs for all types of materials and applications.
- A full range of fractional, letter, wire gauge and metric sizes.

W & B's superior in-stock selection of drills frequently enables you to eliminate expensive "specials". You get the advantages of faster service . . . lower costs . . . top-notch performance that is inherent in every W & B tool.

NUMBER 555
.1/2" DIAMETER
6-1/2" O.A. LENGTH



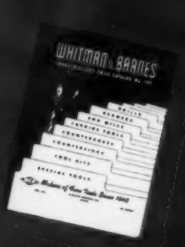
NUMBER 418
.0059 DIAMETER
.75" O.A. LENGTH

YOUR W&B DISTRIBUTOR . . . THE BEST SOURCE FOR EVERY DRILL

Your W & B distributor knows the complete line of Whitman & Barnes drills and their best applications. He stocks these standard drills to give you fast service. It will pay you in higher production . . . lower costs to contact him for your every drill need.

W&B HAS SPECIFICALLY DESIGNED DRILLS FOR:

Aluminum • Armor Plate • Bakelite • Brass • Bronze • Cast Iron • Chrome Alloys • Copper • Die Steel • Fibre • Glass • Hard Rubber • Magnesium • Marble • Masonry • Plastics • Sheet Metal • Slate • Stainless Steel • Titanium • Wood • Zinc



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"MAKERS OF FINE TOOLS SINCE 1848"

DRILLS AND REAMERS

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How to be SURE about Surface Roughness

NO NEED TO GUESS or wonder about the roughness of parts that you make or buy. With the PROFILOMETER® at hand, you KNOW the roughness, because —

1 The Profilometer *measures* surface roughness in definite *microinch units* (arithmetical or r.m.s. average height). It eliminates the errors and uncertainties of inspection by touch or sight.

2 It is *accurate* and *dependable*—even below 3 microinches. Cannot be set to give wrong readings.

3 It's a sturdy, portable SHOP TOOL — as easy to use as a dial gage.

4 It is *versatile.* Measures almost *any* surface, internal or external, over any desired length. Measures plastics, glass, etc. as readily as metal.

5 It's been *thoroughly proven* in thousands of production and inspection departments — *since 1936.*

FREE ILLUSTRATED BULLETIN gives details: describes cost-saving applications. *Write for it!*

Representatives in principal industrial centers throughout the Free World

Profilometer is a registered trade-mark.

MMC® MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 22

Talk of the Month

Technological Promises and Progress

by J. Lewis Powell

Office of Assistant Secretary of Defense

(Supply and Logistics)

U. S. DEPARTMENT OF DEFENSE

ONE THOUSAND DOLLARS-PLUS/SEC, or about $100 million a day is what this nation spends for defense. This is the premium for preparedness, based on the direct military budget alone. A community supports a fire department because it realizes that there is no completely fool-proof method of fire prevention. Accidents and arsonists are realities that must be recognized. Political uprisings and dictators are realities, too. These can cause wars, hence the need to support an Army, Navy, and Air Force.

Just as we consider the cost of a fire insurance premium, let's consider the cost of preparedness — or war prevention premiums.

Usually this subject is dismissed with the platitude that war has gone technological. Just what do we mean when we say war has gone technological? Let's consider some specific examples:

- Now a B-52 is a pretty big airplane — it weighs better than 40 tons. You knew that, but did you know it costs more than its weight in silver?
- Your clothes weigh 8 to 11 lbs. Sir Launcelot's armor weighed 84 lbs, but the gear of a jet fighter pilot weighs 144 lbs. That is a factor in logistics too.
- A B-17 was a pretty important plane in World War II. Thousands of them were built. But did you know if you took all the engineering man-hrs spent on all the B-17's ever built, you still wouldn't have enough engineering man-hrs to build one B-52?
- In the publication *Planes*, issued by the Aircraft Industries Associa-

Adapted from an address at the recent meeting of the Drop Forging Association, in New York.

ANOTHER CUSHMAN CHUCK AT WORK!

Hold it right and machine it faster with . . .
CUSHMAN manually operated chucks,
air operated chucks and cylinders,
power wrench chucks and power wrenches,
pinch jaw chucks—hand and automatically operated,
boring mill and face plate jaws.

CUSHMAN CHUCKS,
a product of American quality,
labor and materials.

Sold through
your industrial
distributor.

THE CUSHMAN CHUCK COMPANY

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1C53

PRECISION PRODUCTION PROBLEMS?

Here's help from Bausch & Lomb

in TOOL DESIGN
INSPECTION
FABRICATION
MEASURING
TESTING

NEW! ALIGNMENT INTERFEROMETER

Accurately measures small changes in angle over a range of 30 seconds of arc (±15 seconds). Easy direct scale readings to 0.2 seconds (0.000006").

BENCH COMPARATOR

Exclusive understage illumination—no complex set-ups, no holding fixtures for most work. Magnified silhouettes show errors instantly. Reads to 0.0001" with optional micrometer stage.

STEREO-MICROSCOPES

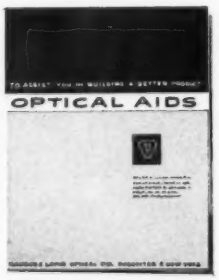
Magnified 3-D views of tiny parts. Dustproof, shockproof, can be mounted right in machine or fixture. Speeds assembly, inspection. Most complete line, widest field of view.

CONTOUR MEASURING PROJECTOR

Shows magnified silhouettes or surface views. Simple operation, highest precision measurements: to 0.0001", linear; to 1 minute of arc, angular.

OPTICAL AIDS CATALOG

Time-and-money-saving data on Surface Comparators, Industrial Magnifiers, Macroscopes, Microscope Bodies, Micrometer Discs, Wide Field Tubes, Brinell Microscopes, Shop Microscopes.



NEW TOOLMAKER'S MEASURING MICROSCOPE

Quickly measures opaque or transparent objects of any contour. Linear, accurate to 0.0001"; angular, to 1 minute of arc.

MAIL COUPON TODAY FOR VALUABLE DATA

BAUSCH & LOMB OPTICAL CO.
77326 St. Paul St., Rochester 2, N. Y.

Please send literature on optical production aids checked below:

☐ Alignment Interferometer ☐ Bench Comparator ☐ Contour Measuring Projector ☐ Toolmaker's Microscope ☐ Stereomicroscopes ☐ Optical Aids Catalog

NAME .....
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COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

BAUSCH & LOMB
SINCE B&L 1853

CIRCLE INFORM-A-GRAM KEY NO. 24

tion, it is noted that "the electronic system alone" of a typical missile "has 36,000 to 37,000 separate items which must function properly if the missile's flight is to be successful." If each item is so reliable that it would fail only once in 100,000 times, the mathematical chances are that one missile in three would be a misfire.

- The *S. S. United States* and the *S. S. America* are the two largest American Merchant Marine ships afloat. Yet, they both could be placed side-by-side on the flight deck of a *Forrestal* class carrier. The Empire State Building is about as high as the *Forrestal* is long, and few cities can boast of buildings taller than the *Forrestal* (25 stories).
- The NIKE is a fairly simple missile, but here is what William C. Burnett of Southern Bell has to say about it in *The Military Engineer*:

  "The complexity of a NIKE system may be visualized from the following statistics: It contains approximately 1,500,000 parts, 217,000′ of conductor wire, 2,000′ of coaxial cable, 2,000 electron tubes, 12,000 resistors, 5,000 capacitors, 460 relays, 1,250 coils, 7,000′ of interconnecting cables for the ground guidance section, 5,600′ of similar cable for the missile handling section, a telephone switchboard for 20 or more lines, and many more items. The size and complexity of the job of making equipment to control the NIKE in flight requires the use of some 20,000 engineering drawings."
- Lindbergh's plane, with its powerful engine, flew non-stop New York to Paris. If that engine had a little more power, today we could use it as a starter on a jet.

Technology Won't Stand Still

A good index of man's progress is speed, the speed at which man can travel. In Nero's time, or even for 1500 years before that, man could travel only as fast as a horse could carry him. When Columbus discovered America, the speed at which man could travel was still limited to the speed of a horse. Even two centuries after that, when Paul Revere made his famous ride, he was dependent on Dobbin. So, on a graph we would have a straight line from 1500 B.C. to about 1830. More than 30 centuries and no progress!

In 1830 a tremendous historical event happened: After centuries of scientific stalemate, the "Iron Horse"

What that Red Ring MEANS

That Red Ring on a gear shaving cutter means it was made by an organization which has more experience and success in this field than any other in the world.

That Red Ring marks the product of engineers and shop men who devote all their working time to these CUTTERS — nothing else.

That Red Ring reminds the user that these specialists are ready to help him get off the hook if he runs into a troublesome gear problem.

That Red Ring says "This cutter is designed and manufactured to deliver the best possible shaving performance."

Write for bulletin CR 56-10

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 25

broke the "Oat Barrier," mankind was liberated from the athletic prowess of horses as a means of transportation, and the technology of transportation was born.

Progress plodded forward. In 1910, our first military airplane had a guaranteed speed of 42 mph. Thirty-five years and two weeks later, persistence had pushed speed up to 470 mph. It took man more than a third of a century to go from 42 to 470 mph.

However, in 1945 progress changed its pace, IT STAMPEDED! In the decade from 1945 to 1955 man catapulted speed from 470 mph to more than 1,500 mph.

Our graphed curve which ran dead level for more than 30 centuries curved gently upward with an increasing slope from 1830 to 1945. Then, in 1945 it careened around a corner and shot skyward. The horizontal line has gone almost vertical. The super-accelerated progress of each recent year exceeds the progress of previous centuries.

Progress itself has become a technical product that can be systematically produced by the technique of applying mobilized brainpower to specific problems. The plodding progress which had characterized the first industrial revolution has been replaced by the synchronized research of organized science.

What Do We Have?

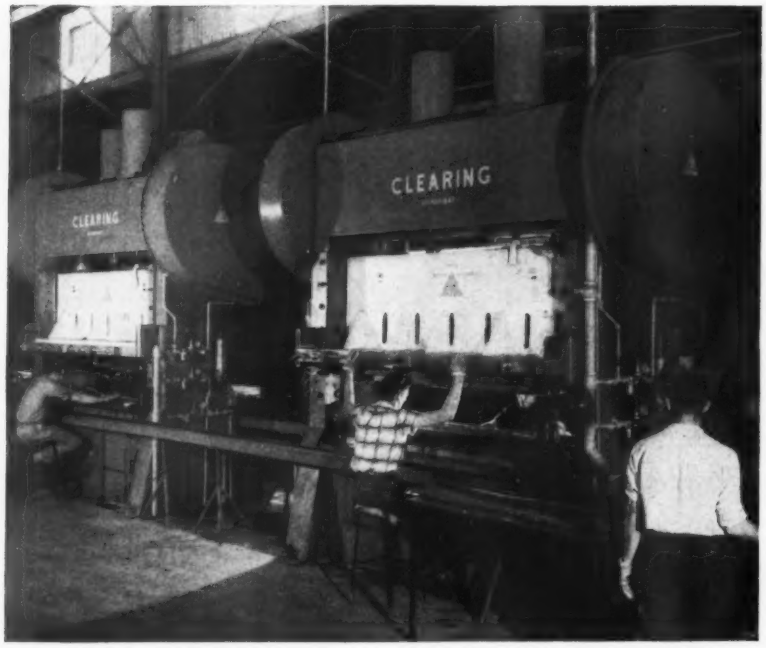
Technology gives us the tools of productivity, tools that multiply the might of man's muscles, extend the reach of his arms, and give him eyes that will measure precisely the ten-thousandth of an inch.

Democracy creates the climate for technology to blossom. Automobiles were developed in Europe before America. Yet Europe produced no Henry Ford with a democratic idea that every man should own an automobile. It didn't even produce working men who thought they should have automobiles.

Free Enterprise. This is the catalyst that makes Democracy and Technology click to produce the fabulous new world way of life! This is the motive, the incentive, the pay-off — every man's opportunity to gamble on fame and fortune.

Mix technology, democracy, and free enterprise and you produce a standard of living and political freedom that makes the dreams of Utopian thinkers seem like the puny product of backward imaginations.

Just as we exploit technology for peace and prosperity, we must also exploit it for national defense. Technology has no morals, it is not



CLEARING SERIES-S PRESSES

ARE TOPS AT CENTRAL METAL PRODUCTS COMPANY
BLYTHEVILLE, ARKANSAS

No question about it, Central Metal Products is really set up to knock out a job in record time. Their seven Clearing Series-S presses include 125 and 150 ton capacities. These straight side machines give Central the bed size to handle the outsized stainless steel automotive moldings being produced above. Two point slide suspension and full gibbing controls parts accuracy and adds mileage to die life.

Press maintenance? Practically non-existent. That's important in a conveyorized production operation like this.

Clearing has a new catalog that tells all about these versatile Series-S presses. We'll be happy to send you one. Write today!

Seven testimonials to the efficiency of Clearing Series-S presses are lined up in Central's modern press room.

CMC

CLEARING PRESSES

the way to efficient mass production

CLEARING MACHINE CORPORATION *division of* **U.S. INDUSTRIES, INC.**

6499 W. 65th Street—Chicago 38, Illinois / Hamilton Division, Hamilton, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 26

limited to America, it doesn't care who uses it. It works with equal impersonal efficiency and grim effectiveness for good or evil, for friend or for foe. This is the reality of the age in which we live.

Modern war, whether cold, hot, or lukewarm, is a head-on clash of total economies, total national resources, men, machines and materials. For this reason, military preparedness can be no better than the industrial readiness which backs it up. Military preparedness and industrial readiness are heads and tails on the same coin — they both must be geared to the ever-changing technology of this age.

Our mobilization needs break down into three general categories:

1. *Essential Civilian Requirements.* These are the absolute necessities to keep our economy functioning. These are the materials for water supply, sewage disposal, fire-fighting, police protection, hospitals, food, clothing, and shelter.

2. *Defense Supporting Requirements.* These are the things necessary to maintain our industrial economy so that it can produce military items. For example, freight transportation, communications, repair, maintenance, operating supplies, raw materials, electric power.

3. *Direct Defense Requirements.* These are the guns, planes, tanks, ships, ammunition, missiles, etc., that are used directly by the Army, Navy, and Air Force.

The Business and Defense Services Administration of the Department of Commerce is primarily concerned with Essential Civilian and Defense Supporting items, while the Department of Defense is responsible for planning for Direct Defense items. These programs do not compete with each other. They are both part of the pattern of preparedness.

Technology and Preparedness

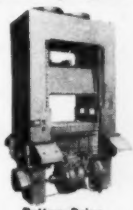
Being a democracy, we have no munitions industry. The United States has a civilian industry that makes peacetime products for the American way of life. When war comes, we have to mobilize our civilian industry for war.

We started World War II with the most gigantic game of hide-and-seek on record. Everybody was "it." Thousands of industrialists descended on Washington to find out who in the military bought what. At the same time, thousands of military men scoured the country trying to find out who could make what. It boiled down to this — if you wanted to buy a land mine you couldn't look up that manufacturer in the Yellow

CLEARING manufactures the right press for you

Check the press or literature in which you are interested. Tear out the page and send it to Clearing.

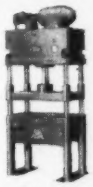
Straight Side Hydraulic

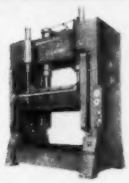

Bottom Drive Mechanical

Top Drive Mechanical

O.B.I.

Gap Frame


Trimming

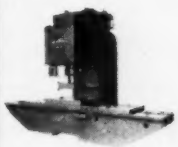

Die Spotting

Transflex Modular

Knuckle Joint

Horn

Forging


Straightening

Series-S

High Speed

Moving Bolster

Column Type Hydraulic with Rubber Pad

AND MANY MORE

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- ☐ Automation Accessories
- ☐ Unusual Press Applications
- ☐ Clearflo Lubrication
- ☐ Plunger Guiding
- ☐ Overload Device
- ☐ Micro-inching
- ☐ Enclosed Presses
- ☐ Cushions

CATALOGS
- ☐ Series-S Crankshaft Straight Side
- ☐ O.B.I.
- ☐ Bottom Drive
- ☐ Hydraulic
- ☐ Brochure—"New Economics of Press Automation"

MOVIES
- ☐ A Moden Fable
- ☐ Transflex—Automation in Action
- ☐ Modular Automation
- ☐ Automation Comes of Age

CLEARING PRESSES

the way to efficient mass production

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SPECIAL RETAINER PLATES . . .

Punch Answers for Piercing Problems

On many punching operations, close center to center hole spacing in work and extremely fine tolerances must be held. R-B makes special retainer plates that will hold punches and die buttons exactly to your spacing specifications.

Any shape, size or number of punches and die buttons can be incorporated in the designing of your special R-B retainer plates. Also, ball locks are built into each special retainer to provide the same quick radial and vertical locking of punches and die buttons found in standard R-B retainers.

Special R-B retainer plates are made of tool steel which is precision ground after hardening. You will save skilled man hours in die construction and maintenance by using these multiple hole retainer plates. Result—more work completed each day and increased profits for you.

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ALLIED PRODUCTS CORPORATION
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CIRCLE INFORM-A-GRAM KEY NO. 28

Pages of your phone book. The man who could make a land mine didn't know what a land mine was, let alone know he could make it.

Two of the principal products we produced were "Surpluses" and "Shortages." We had ships without engines, planes without propellers, tanks without transmissions.

It is elementary, therefore, that if we are not going to have a big game of hide-and-seek next time, we had better match up our military producers and our military requirements now. For sustained readiness, elementary preparedness demands that:

The military must always know who can make what, how much can he make, and how fast.

Industry must always know what military agency wants what, how much, and how soon.

The stampeding technology has erased the security which formerly was stored in stockpiles. The electronic wonder of today, like today's newspaper, will be obsolete tomorrow.

There is no longer any continuity of technology between wars. Each war involves a radically new technology, and not much security can be gained from stockpiling awesome quantities of specific military mechanisms that become hopelessly obsolete faster than they can be replaced. Instead, it is vital that we maintain minimum stockpiles but keep them up-dated and geared to progress in technological developments.

These stockpiles of up-dated weapons must be continuously backed up by maximum industrial readiness to replace them with still later models.

Matching specific potential military customers to individual potential producers is the basic step in all military industrial mobilization planning in the United States. The principal program for doing it is the revised Production Allocation Program. The basic concept is similar to the Navy principle of "Battle Stations."

Industrial Mobilization Planning gives "Battle Stations to Industry" by matching up actual military production schedules with specific planned producers.

By having the military and industry sit down together and do across-the-table planning in peacetime, the buyer and seller discover each other now. In event of war, this would:

- Eliminate wartime hide-and-seek;
- Spread the mobilization impact more evenly across our capacity; and
- Get better utilization of each plant since management has an opportunity to plan the use of its own plant.

Planning for items of comfort, convenience, and morale is prohibited, while planning for about 500 items on a classified Preferential Planning List is mandatory.

ASPPO and the Register

To talk intelligently about the Production Allocation Program, we need to talk about two things — one called an ASPPO — the other called a Register.

It is quite important that you understand who and what an Armed Services Procurement Planning Officer, or ASPPO, is. If we had the Army, Navy, and Air Force, including all their branches, planning at will with every plant, industrial management would be run ragged answering the same questions over and over again for each service.

Similarly, the services would be competing with each other with conflicting claims for the same capacity. To prevent this we assign an ASPPO for each plant. His job is to represent all of the Armed Forces and act for the Assistant Secretary of Defense in coordinating all of the mil-

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Shears 4 Models
Punch Press 2 Models
Power Punch 2 Models
Rollers 8 Models
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Powershear 4 Models
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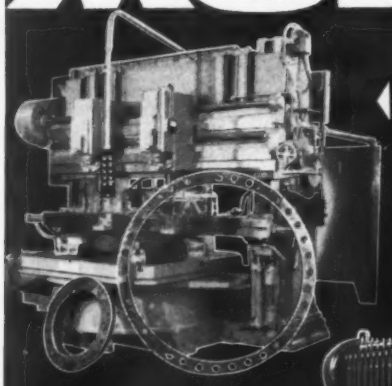
MOLINE



HD68 drills bolt circles from 12" to 100" diameter. Each of the two spindles has capacity for 2½" drill in steel. Operating cycle is fully automatic.

HD13 straight line-type drilling machine with capacity for thirty ¾" drills in steel. Used for work on heavy castings, round and rectangular steel tubes, structural shapes, plates and grader blade drilling or countersinking.

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Use an individually designed "Hole-Hog" Machine Tool for such jobs as...

- Multi-Spindle Boring
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- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
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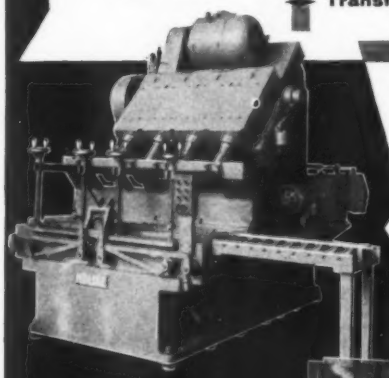

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13CB hydraulic feed cylinder boring machine. V-8 engine blocks are rough and finish bored for wet-type cylinder sleeves. Units of this kind are applicable for transfer machines.

MR152 performs drilling, reaming, spot facing and chamfering operations on tractor rear axle housings. A companion machine, MR151, does tapping in addition to the foregoing operations. Work holding fixtures are mounted on power driven trunnion.

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REPRESENTATIVES IN PRINCIPAL CITIES
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CIRCLE INFORM-A-GRAM KEY NO. 30

itary planning with that plant. Any one wanting to plan with your company must funnel his request through your ASPPO.

There are two things you should do with your ASPPO:

1. Help him make a good informative survey of your plant.
2. Build your production know-how into mobilization production schedules before you sign them.

If you are a "Planned Producer", you and your ASPPO have a job to do. It is your job to balance military mobilization requirements against production capacity. It is up to you to work out the best compromise between military logistic requirements and your plant capacity.

What is the mobilization line-up? Who plans with whom? Periodically, the Department of Defense publishes a book called the "Register of Planned Mobilization Producers" (RPMP). This Register lists the 21,000 plants with whom we are planning and it cross-references each plant listed to the military departments that are planning with it.

Every entry in the Register advertises to all Army, Navy, and Air Force procurement planning officers that that particular producer is interested in planning for wartime production. For each plant listed, it also shows who is the Armed Services Procurement Planning Officer (ASPPO).

Although the Register is a classified document, every manufacturer is entitled to see his own entry, or to be told he is not registered. This information can be obtained from the nearest Army, Navy, or Air Force procurement office.

If you are registered, here is what you should do:

1. See if your plant survey is up-to-date.
2. See if your mobilization schedules are current.
3. See if you are over-planned or under-planned.
4. Contact potential military customers — sell them on your ability.

If you are not listed in the Register:

1. Determine if your production potential qualifies you to be a planned producer.
2. Identify and locate your potential military customers.
3. Sell your potential customers on your know-how and ability just as you would sell any other customer.

However, remember not all essential plants are, or should be, planned producers. This planning is limited to planning with manufacturers of

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Trig-R-Dex is a completely new concept in manual indexing that simplifies and speeds straight or spiral operations.

To index—simply grasp the Trig-R-Dex handle, push down on the trigger button and move the handle until index pin engages the next hole, pull handle to stop position and you have indexed one increment. During work processing operations, the Trig-R-Dex handle always remains stationary. But, the index plate is keyed to the driver holding the work center . . . this assures the index plate, center and workpiece turn as a unit.

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Because Trig-R-Dex is simple in design, of rugged construction, easy to operate and precision made, it will give years of accurate, trouble-free service while reducing costs and boosting your production.

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U.S. PATENT NO. 2,711,324

CIRCLE INFORM-A-GRAM KEY NO. 31

CIRCLE INFORM-A-GRAM KEY NO. 32

hard to get, hard to make, direct military items.

Preparedness Cannot Be Static

Since technology won't stand still, mobilization planning in this day and age might be compared to changing a front tire on a speeding automobile while it's careening down a winding country lane. Preparedness cannot be static. Strategy, tactics, production, and even planning itself must all be continuously revised to keep them reconciled with the reality of our ever-changing technology and our more complex weapons.

The newer a weapon is, the more complex it is. Similarly, the more complex the weapon or device, the shorter its life-span.

Each newer, more complex, device is even more rapidly replaced by a still newer even more complex device.

These truisms of technology give Uncle Sam a problem similar to the dilemma of a one-armed man on a flying trapeze. He has to let go of the ordnance and equipment of yesterday, yet the weapons of the future have not yet swung completely within reach.

Someone always asks the Sunday Supplement Question — "Are we preparing for the long war or the short war?" May I suggest you ask your Fire Department if they are planning a big fire or a little one. You may find your question startles them a little. We are very much like a Fire Department; we don't plan wars any more than Fire Departments plan fires. Just as a Fire Department has plans to meet the possible kinds of fire that might break out, we plan to meet the kinds of war which might erupt. Just as the Fire Department hopes never to have a fire, we just as fervently hope there will never be a war.

Since democracies don't start wars, any potential enemy automatically has the fantastic advantage of deciding where, when, and how war will start, if he elects to start one.

Those considerations have much to do with the probable length of any war. Obviously, if we elected to be thoroughly prepared for only one kind of war, at the expense of being unprepared for other kinds — any intelligent enemy would elect to start the kind for which we were the least prepared. Unpreparedness invites war!

Therefore, our planning must be flexible enough to meet the reality of any time, place, and method chosen by the enemy.

As in most other things, there are different viewpoints on the subject

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High Speed Steel Taps and Dies and Thread Plug Gages?

In Stock For Immediate Delivery

Size	Threads Per Inch
00	90-96
0	56-64-72
1	56
2	48-72
3	40-60-64
4	32-42-44-56-60-64-72-90
5	30-32-36-48-56-60-80
6	30-36-38-42-44-48-56-60-64
7	28-30-32-34-36-38-40
8	24-26-30-38-40-44-48-56-60-64-80
9	24-28-30-32-40
10	18-20-22-26-28-30-36-40-48-56-64
11	20-22-24-28-30
12	20-22-26-27-30-32-36-38-40-48-56
13	20-22-24-32
14	16-18-26-28-30-32
15	18-20-24-32
16	16-18-20-22-24-36
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18	16-18-20-24
19	18-20
20	16-18-20-24-32
22	16
24	14-16-18-22-24
26	14-16
28	14-16
30	14-16
1/16	56-60-64-72
5/64	56-60-64-72
3/32	38-48-50-56-60-64
.107	32
7/64	36-40-42-44-48-50-56
1/8	30-32-36-40-48-56-60-80
.132	30
9/64	30-32-38-40
5/32	24-26-28-30-32-36-38-40
11/64	24-26-30-32-36-38-40
3/16	12-18-20-22-24-26-28-30-32-36-40-48-56-64-72
.198	24
13/64	24-28-30-32

RIGHT HAND TAPS AND THREAD PLUG GAGES

Size	Threads Per Inch
7/32	20-22-24-26-27-28-30-32-36-38-40
.227	24
15/64	20-24-28-32-40
1/4	16-18-22-23-24-25-26-27-30-32-36-40-48-50-56-60
17/64	18-20-27-28
.268	36
.277	40
9/32	18-20-24-26-27-28-32-36-40
19/64	18-24
.300	22
5/16	12-14-16-20-22-26-27-28-30-32-36-40-48-50-56
21/64	16-20-24
11/32	16-18-20-22-24-26-27-32-40
23/64	16-24
.365	28
3/8	12-14-18-20-22-26-27-28-30-32-36-40-48-56
25/64	16-24-27
.400	24
13/32	12-14-16-18-20-24-27-32-40
27/64	28
7/16	12-16-18-22-24-26-27-28-30-32-36-40-48-56
29/64	12
15/32	12-14-20-24-27-28-32-40
1/2	12-14-16-18-22-24-26-27-28-30-32-36-40-48-56
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.550	24
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.800	16
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.885	14
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1-3/32	8-9-12
1-1/8	8-10-14-16-18-20-24-27-32
1-5/32	7-12-24-26-32-40
1-3/16	8-10-12-14-16-18-20-24-32
1.220	32
1-1/4	8-10-14-16-18-20-24-28-32
1-5/16	6-8-10-12-14-16-18-20-24-32-48
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1-7/16	6-8-10-12-14-16-18-20-24-28-32
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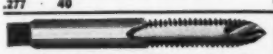
1-29/32	32
1-15/16	8-10-12-14-16-18-20-24-32
2	4½-5-8-10-12-14-16-18-20-24-32
2-1/16	12-14-16-32
2-1/8	4½-8-10-12-14-16-18-20
2-3/16	12-16-20
2-1/4	4½-8-10-12-14-16-18-20-24
2-5/16	12-16-18-20
2.360	18
2-3/8	4-5-10-12-14-16-18-20
2-7/16	16-20
2-1/2	4-6-8-10-12-14-16-18-20
2-9/16	12-16-18
2-5/8	8-10-12-14-16-20
2-11/16	12-16
2-3/4	4-8-10-12-14-16
2-7/8	8-10-12-16
2-15/16	12-16
3	3½-4-8-10-12-16-18
3-1/8	12-16
3-3/16	20
3-1/4	4-8-12-14-16-18
3-3/8	10-12
3-1/2	4-5-12-16
3-3/4	4-5-12-16
4	4-5-12
4-1/8	12
4-1/4	8

Size	Threads Per Inch
0	80
1	56-64-72
2	56-64
3	48-56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-32-40
12	24-28-32-40
14	20-24
5/32	36
3/16	32-40
1/4	20-23-24-25-27-28-32-40-48
.277	40

LEFT HAND TAPS AND THREAD PLUG GAGES

Size	Threads Per Inch
5/16	18-20-24-27-28-32-40
11/32	24
3/8	16-20-24-27-32-40
13/32	20
7/16	14-20-24-27-28-32-40
1/2	12-13-14-16-20-24-27-28-32-40
9/16	12-18-20-24-27-32-40
.622	8
5/8	10-11-12-16-18-20-24-28-32
11/16	11-12-16-18-20-24-32
.720	8
3/4	9-10-12-16-18-20-24-32
13/16	10-16-18-20
7/8	9-10-12-14-16-18-20-24-32
15/16	12-14-16-18-20-32
1	8-12-14-16-18-20-24-28-32
1-1/8	7-12-18-20-24-32
1-1/4	6-7-8-12-16-18-20
1-5/16	12-16-18-20
1-3/8	5-6-8-10-12-16-18-20-24
1-7/16	10-12-18
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	5½-8-10-12-16-18-20
1-11/16	8-10-12-16-18-20-24
1-3/4	5-8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	5-8-10-12-14-16-18-20
2	4½-8-10-12
2.215	20
2-7/32	20
2-1/4	4½-8-12
2-5/16	24
2-⅜	4-8-12
2-11/16	16
2-3/4	4
2-7/8	24
3	4-8



RIGHT HAND—UNLISTED "GUN" OR SPIRAL POINTED TAPS

Size	Threads per Inch	Size	Threads per Inch
0	80 NF		
		⅞	9 NC, 14 NF
1	56 NS	1	8 NC,
2	56 NC, 64 NF		12-14 NF
9/16	12 NC, 18 NF	1⅛	7 NC, 12 NF
⅝	11 NC, 18 NF	1¼	7 NC, 12 NF
11/16	11 NS, 16 NS	1⅜	6 NC, 12 NF
¾	10 NC, 16 NF	1½	6 NC, 12 NF

RIGHT HAND—UNLISTED "PULLEY" OR EXTRA LENGTH TAPS

Size	Threads per Inch	Size	Threads per Inch
4	40 NC, 48 NF	¾	24 NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	½	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	⅝	18 NF
¼	28 NF	⅝	16 NF
5/16	24 NF	Also Larger Sizes NC & NF	

RIGHT HAND "PIPE" TAPS

TAPER "NPT" Size	TAPER "NPT" Thread	STRAIGHT "NPS" Size	STRAIGHT "NPS" Thread	EX. LENGTHS TAPER "NPT" Size	EX. LENGTHS TAPER "NPT" Thread
1/16	27	1/16	27	1/16	27
¼	27	1	8	⅛	27
2½	8	1¼	11½	¼	18
3	8	1½	11½	⅜	18
3½	8	2	11½	½	14
4	8	2½	8	¾	14
		3	8	1	11½
		3½	8		
		4	8		

LEFT HAND 'PIPE TAPS' TAPER AND STRAIGHT

Size	Thread	Size	Thread
1/16	27	1	11½
¼	27	1¼	11½
⅜	18	1½	11½
½	18	2	11½
¾	14	2½	8
1	14	3	8

"OVERSIZE TAPS"

RIGHT HAND N. C. and N. F. SIZES
MACHINE SCREW No. 2 TO No. 5
PLUS .002 TO .003
MACHINE SCREW No. 6 TO No. 14
PLUS .003, .005, .010
FRACTIONAL ¼" TO 1½"
PLUS .003, .005, .010 AND .015

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AVAILABLE FOR QUICK DELIVERY

2 WEEKS DELIVERY—When ordering or requesting quotations, kindly furnish us with the following information:

(a) Kind of material being machined.
(b) Depth of hole, through or bottom.
(c) Tap to be used horizontally or vertically.
(d) Will tap turn, or is piece expected to be turned.
(e) Is tapping job expected to be done in one pass.
(f) Would tap be backed out of hole, or machine stopped for release of tap.
(g) If possible, submit thread length, and overall length of tap desired with a blue print.

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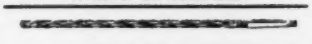
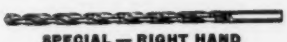
IMMEDIATE DELIVERY

H.S.S.S. MACHINE REAMERS
DECIMAL, FRACTIONAL, LETTER, AND WIRE GAUGE SIZES
Prices On Application
Write for Our Stock List





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Industrial Cutting Tools
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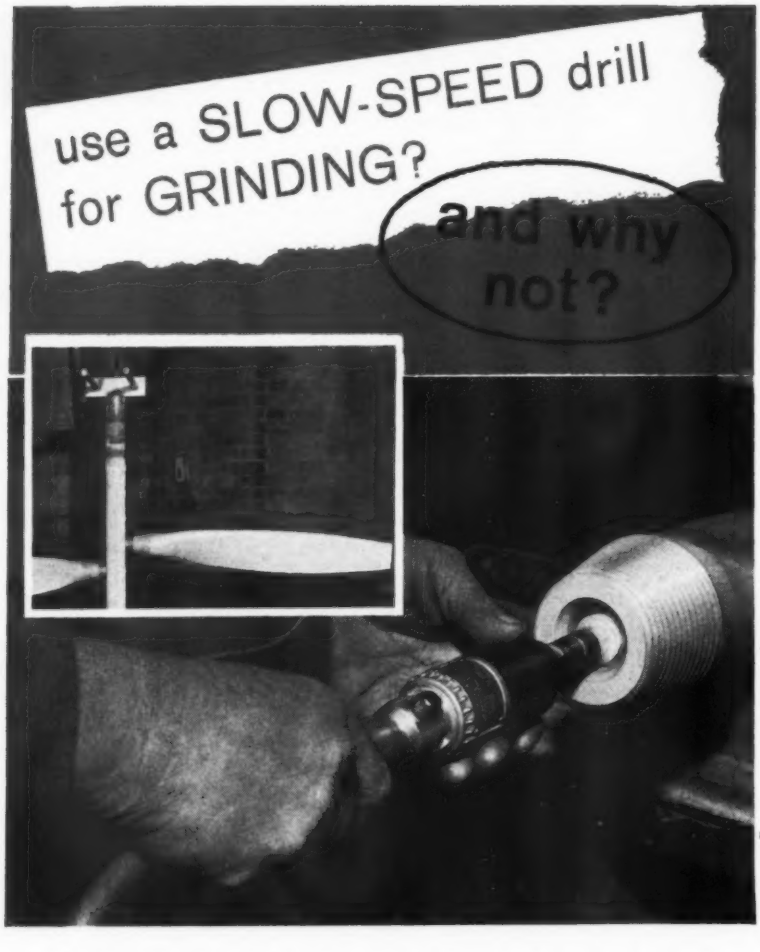
CIRCLE INFORM-A-GRAM KEY NO. 33



One of the final steps in the production of propellers at McCauley Industrial Corporation is the anodizing of the propeller blades. To insure complete coverage in the vat, each blade is attached to the dipping fixture by an expanding bolt fitted into the opening at the hub end of the blade.

After anodizing, this opening must be carefully finished to remove any burrs caused by the expanding bolt. The shape of the opening requires the use of a cone wheel. The work to be done requires a slow speed tool, much slower than would normally be used with an abrasive attachment of this type and size.

So, for this metal removal job, a Buckeye drill, with cone wheel attachment, was recommended! It's a small tool, just 7 inches long; it's a light tool, less than two pounds. Makes it easy to get a perfect finishing job every time, without disturbing the exact tolerances typical of McCauley props.

The Buckeye Tools approach to unusual portable tool problems is refreshingly free from time-worn traditions and preconceived notions. Perhaps this uninhibited approach could help solve your portable tool problem.

Why AIR Tools?

Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, if you're using Buckeye air tools, you can almost forget about tool maintenance.

Buckeye Tools
CORPORATION

CIRCLE INFORM-A-GRAM KEY NO. 34

of mobilization planning. Not everyone agrees with me.

One goes like this: Any new war would be over overnight, so why plan? This is like saying that there is no use studying first aid because if you get in an accident you are bound to be killed. In the event of violent war, victory may well go to the side which can first stagger back to its feet and deliver the second blow.

Another argument against planning goes like this: We didn't use all of our plans for World War II or Korea, so why plan now? This is the logic which says if we didn't use all of the fire plugs in the last two fires, why have fire plugs?

The third argument goes like this: Planning is good but you shouldn't do it until you know your exact quantities of tanks, planes, ships, weapons, etc. This is the logic which says fire plugs are wonderful but don't install them until you know how much water it takes to put out a fire of unknown origin at an unknown time in an undetermined location.

No one knows the right requirements for unknown wars. If you lose, presumably you didn't have the right requirements. If you win, "To the victor belongs the surplus." This is the axiom of modern war.

Preparedness a Preventive

The first purpose of mobilization planning is not to prepare to win wars! It's first purpose is to prevent war. Preparedness is a deterrent. When a potential enemy contemplates war, he estimates his chances of winning. The less prepared you are the better his chances and vice versa. If, no matter what the action he contemplates, you appear prepared, then he becomes discouraged or looks for another victim.

Preparedness does make for deterrence. For example, consider a simple illustration. There were more than 50,000 holdups in the United States last year. In no case did a bandit hold up a uniformed policeman. The known preparedness of an on-duty policeman is a powerful deterrent. Similarly, a marauding nation hesitates to invite its own downfall by attacking a nation known to be capable of destroying its attacker. In both cases, publicized preparedness makes "Defense" the powerful deterrent.

Under these conditions, industry and defense are inseparable. Military preparedness is inextricably geared to industrial readiness. Our national strength rests on the sound foundation of an alert, capable military-industry team.

carbide TOOL NEWS

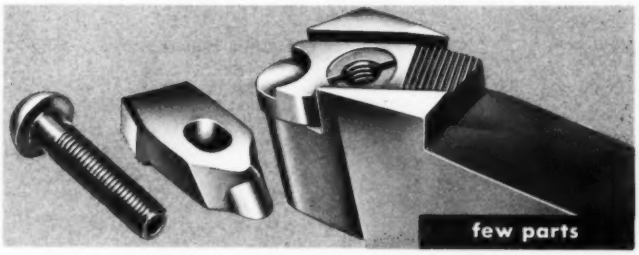
Less than a year ago, a survey of carbide tool users showed that throw-away insert use would triple in five years. Reasons? Industry wants minimum down time, less set up time and no grinding. Users also voted on holder features that would simplify application of throw-away inserts to machining operations.

A pioneer in the application of throw-aways, Wesson Company anticipated industry requirements through continuing market research. Wesson developed tool holders with the features desired by industry . . . and a lot more! The full-scale survey showed how right the design is and led to still further improvements in the Multicut holder.

Users Design Holders for Throw-Aways

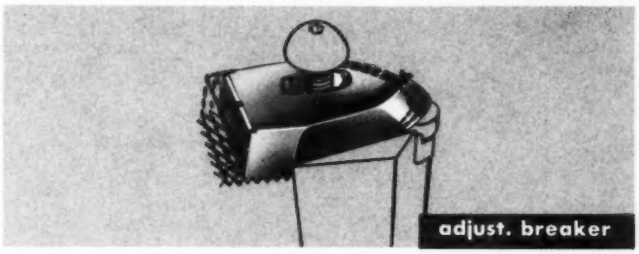
WHAT USERS WANT

WESSON'S ANSWER



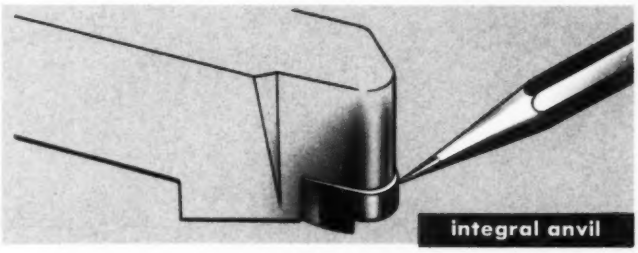
The one thing that all users want is standard parts that can be replaced easily. They want to minimize parts inventory.

The parts of a Wesson throw-away insert holder are completely standard and interchangeable. Wesson put only *three loose parts* in its holder.



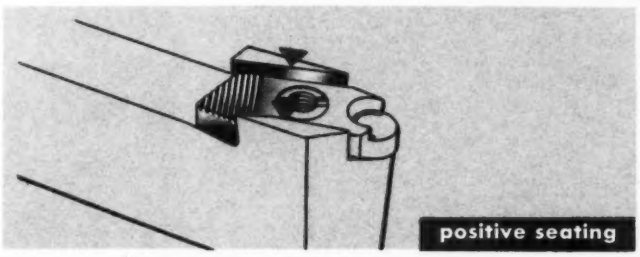
Users want chip breakers with carbide surfaces opposing the chip. They want a chip-breaker clamp that is adjustable to meet specific job requirements.

Carbide-faced chip breakers are integral with the clamp and can be adjusted for light, medium or heavy cuts *without interchanging parts.*



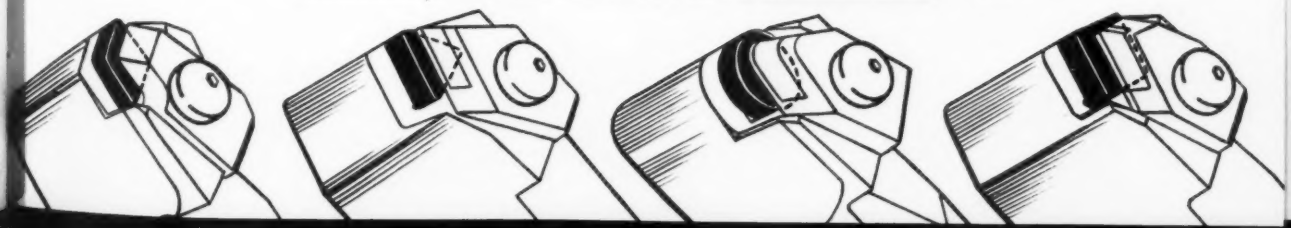
Production engineers want a one-piece anvil-locator so they need not worry about dropping it or incorrectly positioning it.

Anvil of the Wesson holders is integral with the locator, bolted to the shank. *It can't drop out.* It is relieved to clear built-up edges too.



Users want to be able to positively adjust holder parts so they will do the job required and stay put. They want to be able to do this easily.

The clamp in Wesson holders cannot be tightened at the wrong angle. It is side-guided and serrated for *positive* location.



Complex Tools Go Throw-Away Too

Industry combines separate operations and separate tools now that multiple-insert designs have revised the limits on complex tools

Multiple-insert tools have all the advantages of single-point throw-aways *and* savings go up geometrically with added numbers of cutting edges.

Tool designers are now free to design the best tooling for a given operation without having to think about how tools can be sharpened. Designers don't have to worry about relocating cutting edges after each sharpening. Inter-related positions of separate cutting edges only have to be set up once.

Rules that apply to conventional tooling don't necessarily hold when inserts are used. For example, a three-bladed boring cutter has always been considered poor design because it was hard to sharpen and set up.

When throw-away inserts are used, these considerations do not apply. Inserts don't have to be sharpened and, when an insert is indexed or replaced, it is in the correct cutting position. No further location is necessary.

Special holders designed by Wesson engineers for use in metalworking are taking on highly complex forms. Users are finding that by using tools designed to combine operations new economies result.

Typical of Wesson-produced tooling that combines operations in a single design are multiple throw-away insert quill-type boring heads, FIG. 1. These heads also include regrindable carbide inserts. They are used for boring, step counterboring and broad facing operations on locomotive bearing housings.

Another example of design innovation made possible by throw-aways is the multiple diameter boring, facing and chamfering head, FIGS. 2 and 3, used in the production of automotive transmission housings. Such a tool would be impractical if fixed cutting edges had to be ground accurately.

FIG. 1

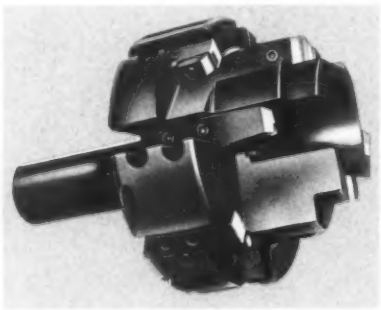


FIG. 2

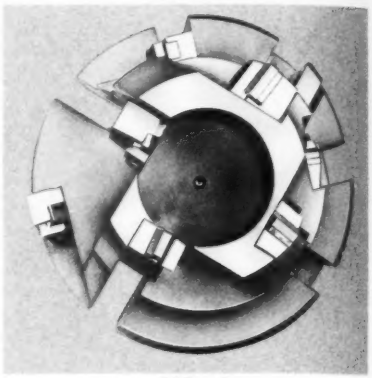


FIG. 3

Impetus is being added to the trend to throw-aways because highly skilled tool grinders are truly vanishing in America. Tool grinding is always costly but, when it is done poorly, costs really soar. To cut costs and improve competitive position, many companies are today tooling entire plants with carbide throw-aways.

Micro-Adjustable Boring Tools

Throw-away insert micro-adjustable boring tools have proved so successful that many special and non-standard designs have been production developed by Wesson engineers. Tools with the micro-adjustable principal save time, improve quality and cut production costs.

Your *special boring-tool problem may already have been solved:*

Request Bulletin #MB-157

tools Wesson carbide Wessonmetal

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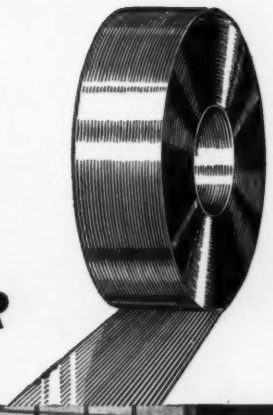

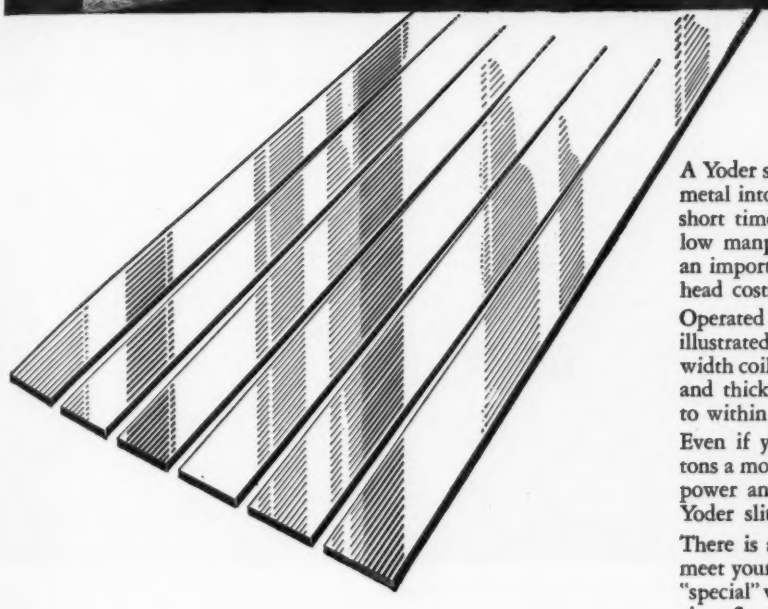

A Yoder slitter converts mill-width coils of flat-rolled metal into many variable-width strands in amazingly short time. Speed, coupled with great accuracy and low manpower requirements, makes a Yoder slitter an important factor in keeping production and overhead costs down.

Operated by only two men, the Yoder Type 3-48 slitter illustrated is designed to accommodate standard mill-width coils up to 48 inches wide, in a variety of metals and thicknesses. The slit strand widths can be held to within a .004" tolerance.

Even if your steel requirements are as little as 100 tons a month, the savings to be realized in time, manpower and raw material costs alone will pay for a Yoder slitter in the first few months of operation.

There is a Yoder slitter designed and engineered to meet your requirements, and to speed the delivery of "special" width stock in a wide range of large or small sizes. Send for your free copy of the fully-illustrated, 76-page booklet, "Multiple Rotary Slitting Lines."

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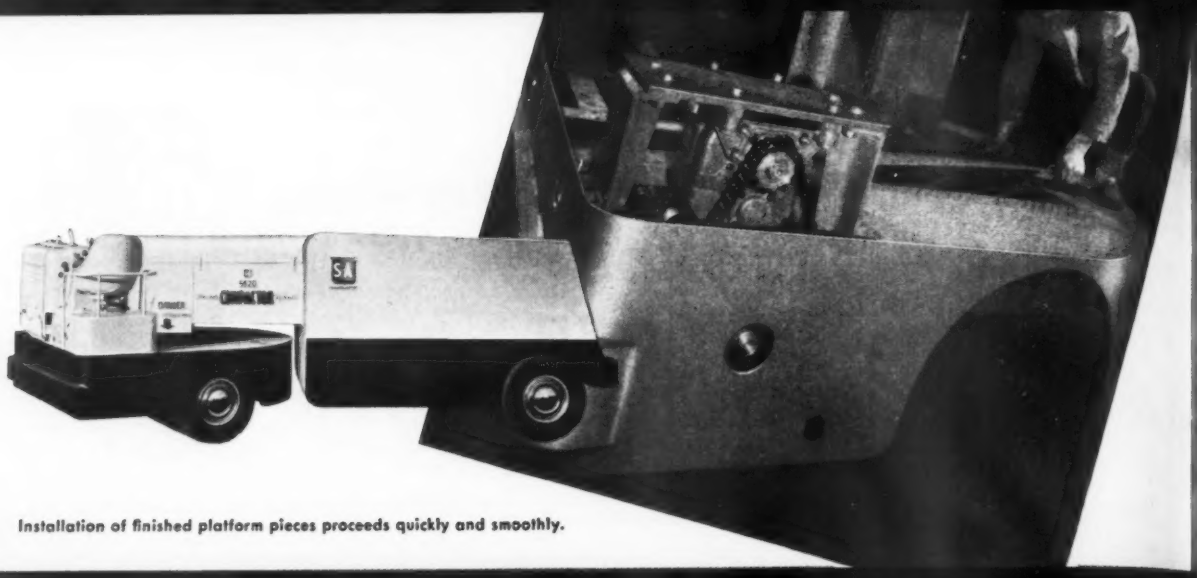

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Niagara Model 1010 shearing 16 gage safety plate for operator's platform of Pneumatic Compactor.

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Wisconsin manufacturer of road construction machinery uses Niagara Underdrive Power Squaring Shears to assure high quality and peak production.

Hard at work on America's highways, Seaman-Andwall compactors, rollers and other machines are opening the way to faster, safer travel.

Meanwhile, hard at work in the Seaman-Andwall plant, a Niagara Power Squaring Shear is opening the way to faster, more economical production.

"With Niagara's Shear in operation," says Seaman-Andwall, "we are able to cut 3 to 5 tons of steel per day. *The Niagara Shear gives us a high quality of accuracy with the utmost in speed and performance.*"

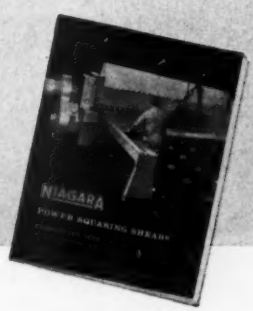
Seaman-Andwall is one of numerous plate and sheet metal fabricators who are making Niagara their choice for power squaring shears. And with good reason!

WHEN IT COMES TO ACCURACY, Niagara's positive, power-actuated self-compensating holddown contacts work with low impact, grips metal securely. Rigid, fully closed box section construction of bed, crosshead, holddown and housings resists all stresses with minimum deflection. Gaging facilities are ultra-accurate. Cutting within micrometer tolerances is assured.

WHEN IT COMES TO SPEED, more working strokes per minute, plus instant engagement of Niagara's exclusive sleeve clutch assure more cuts per hour. There's no need to adjust knife clearance for different thicknesses — holddown feet are self-compensating. Fully visible cutting line, ease of operation and quick-setting gages further boost hourly output.

WHEN IT COMES TO STAMINA, Niagara Shears are built to stand up on the toughest jobs. Simple design and minimum number of parts cut costly repairs. Vital drive components operate in a sealed bath of oil.

LEARN ALL ABOUT NIAGARA SHEARS IN THIS PICTURE-PACKED BULLETIN



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CIRCLE INFORM-A-GRAM KEY NO. 38

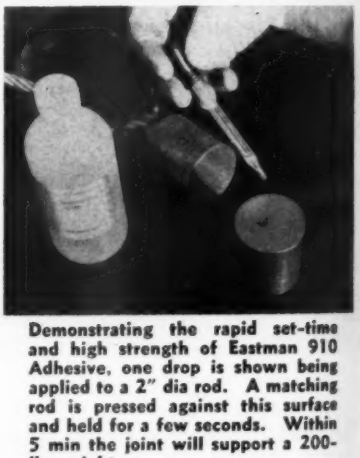
REVOLUTIONARY ADHESIVE MAY AFFECT INDUSTRIAL DESIGN

An unexpected result of a routine test in one of the nation's large research laboratories has led to the development of a new liquid adhesive. Its combination of rapid set-time and high strength promises to have widespread influence on industrial design.

In a recent demonstration, a drop of the adhesive between two pieces of 2" dia steel rod successfully lifted a weight of 200 lbs within 5 min and 5000 lbs within 30 min from application. The strength of the bond continues to increase even beyond this point.

This is accomplished without the necessity for heat, pressure, evaporation of solvent, or long curing times; whereas, other high-strength adhesives require one or more of these conditions for successful bonding. Resulting from the polymerization of a cyanoacrylate monomer, the adhesive action works well with a wide variety of materials including metals, glass, wood, ceramics, rubber, plastics, cork, felt, leather, cardboard, porcelain, and even the human skin.

Among the plastic materials to which the adhesive has been successfully applied are cellulose acetate, cellulose acetate butyrate, styrene, polyester glass laminates, phenolics, epoxies, acrylates, urethanes, and vinyls. Combinations of steel, aluminum, copper, magnesium, bronze, and brass can be bonded effectively.



Demonstrating the rapid set-time and high strength of Eastman 910 Adhesive, one drop is shown being applied to a 2" dia rod. A matching rod is pressed against this surface and held for a few seconds. Within 5 min the joint will support a 200-lb. weight.

The discovery of the adhesive was made in the research laboratories of Tennessee Eastman Company, a division of Eastman Kodak Company. In determining the purity of a compound newly synthesized by the research staff, a laboratory technician

. . . *Continued on page 40*

Original bearings cost 50¢ per hour of life... Bearings, Inc. recommended bearings cost less than 10¢ per hour!

The original bearings on this casting cut off machine at Intricast, Inc., Loudonville, Ohio, producers of investment castings, had a maximum life of 48 hours and their cost was approximately $24 each. The bearings recommended by our engineers cost only $17 and have now been in service for over 200 hours . . . and no indications of failure yet!

"Our most severe bearing application with speeds at 5,000 RPM and the bearings subjected to abrasive grit and casting dust," reports the Intricast Plant Manager. "Maintenance has been practically non-existent with our new bearings and the machine is much quieter," he further stated.

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and

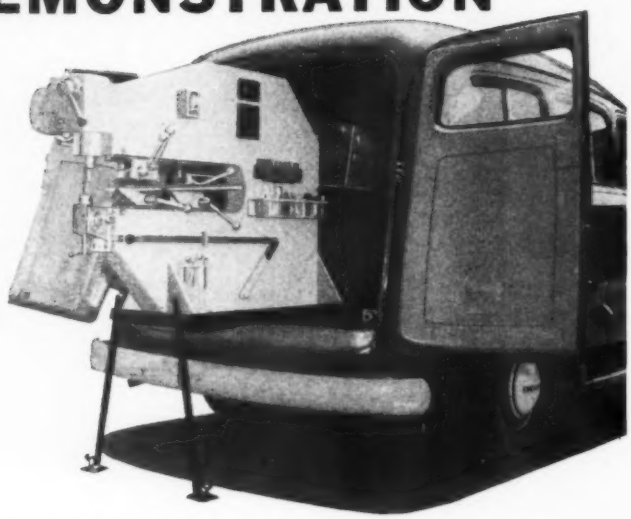
in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville

CIRCLE INFORM-A-GRAM KEY NO. 39

HERE COMES PULLMAX

NOW WE'LL BRING A
PULLMAX MACHINE
RIGHT TO YOUR PLANT FOR A
DEMONSTRATION

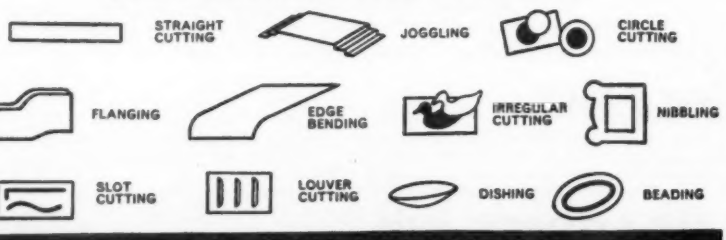


We've found that you just can't believe the amazing versatility of the Pullmax Machine until you've seen it in operation. Now, all Pullmax Sales Engineers are equipped with a station wagon carrying a Pullmax machine. He's ready to come to your plant (by appointment) and demonstrate to you and others, this "Complete sheet metal shop in one Machine". You owe it to yourself to see this revolutionary machine.

Just write and tell us when you would like to see the Pullmax demonstrated at your plant.

Catalog Upon Request

ONE PULLMAX DOES ALL THIS



AMERICAN PULLMAX CO., INC.

2469 NORTH SHEFFIELD AVENUE, CHICAGO 14, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 40

. . . Adhesive from Page 38

placed a sample between the two glass prisms of a refractometer. His readings observed and recorded, the technician was dismayed to find he could not separate the valuable prisms. This led to subsequent tests on a tensile-measuring machine which showed that this new substance developed a bond of several thousand psi.

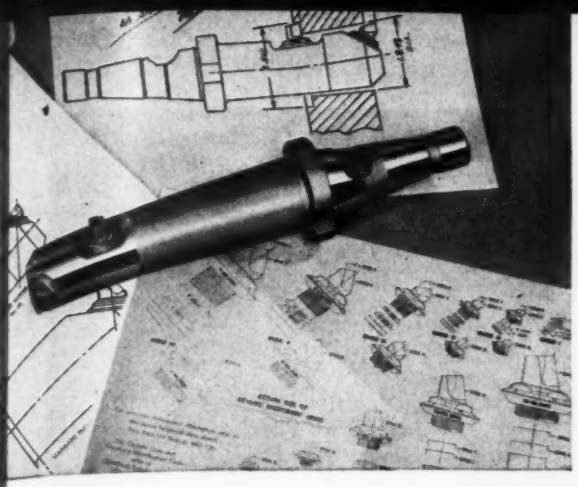
The assembly, used to demonstrate the strength of this adhesive, is shown placed between a crane hook and a lifting harness. The arrow indicates the joint between the rods. Within 30 min of setting time the joint will support a weight of 5000

From its evaluations Eastman anticipates industrial applications for the adhesive will develop 1) where extreme speed of setting and curing is needed, 2) where there is a necessity for bonding like or unlike materials not normally responding to conventional adhesives or cements, and 3) where there is a requirement for high bonding strengths within the confines of small joining surfaces such as miniature assemblies of intricate design. Thus, the combination of properties of the cyanoacrylate compound, termed "Eastman 910 Adhesive," may bring a new approach to the use of adhesives in design and production.

The rapidity with which strong bonds are formed depends upon the nature of materials being bonded. Tests have shown glass-to-glass bonds to be unbreakable within 5 to 15 sec. Wood-to-wood bonds require from 3 to 5 min to set and only 2 to 3 hrs before the bond can withstand rough handling. Steel-to-steel bonds set in 15 to 20 sec, develop 2000 psi tensile strength within 30 min and 5000 lbs after 48 hrs. After a cure of several weeks, the tensile strength increases slightly.

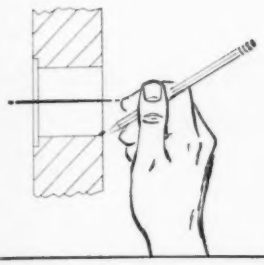
Among the conditions which weaken or destroy the bond formed by Eastman 910 Adhesive are prolonged exposure to high humidity and tem-

. . . *Continued on page 42*

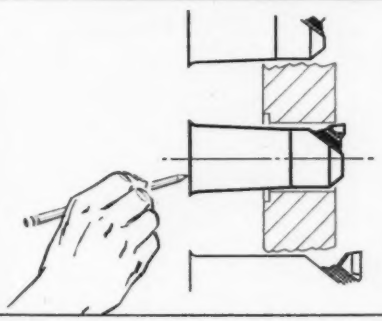


now, design your own semi-standard cluster tooling from stock Microbore components

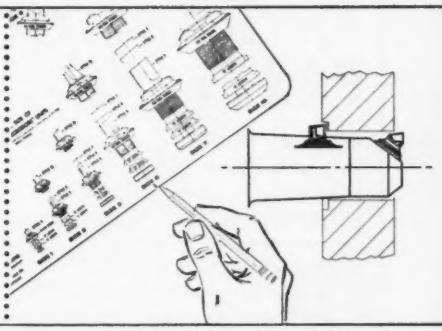
SIMPLE 5-STEP PROCEDURE



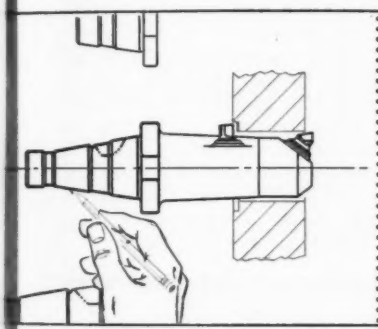
1 Make a full scale layout of bore to be produced, on tracing paper.



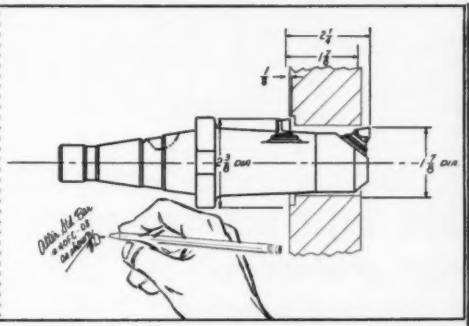
2 Place layout over standard bar nose templates. Select and trace the most suitable bar nose.



3 Select suitable Microbore Unit from template and trace in position for added tool station.



4 Trace the desired shank on boring bar, using shank template.



5 Microbore tool stations will be added to the standard Microbore Boring Bar as specified.

Simple cluster tooling designed in this manner costs little more than standard bars, substantially reduces delivery time, and is thus ideally suited for low-production applications.

NEW "TOOL DESIGNERS LAYOUT KIT" MAKES IT POSSIBLE!

Using transparent, full-size templates and a price index, it is now possible to design, pre-price and order your own semi-standard cluster tooling from stock Microbore components.

Any one of the several hundred standard Microbore Boring Bars may be converted into two- or three-tool cluster bars for such operations as boring, facing, counterboring and chamfering at one pass.

DeVlieg® Microbore® System

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

2720 West Fourteen Mile Rd., Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 41

DEVLIEG MICROBORE

DIVISION OF DEVLIEG MACHINE COMPANY

2720 West Fourteen Mile Rd.
Royal Oak, Michigan

MAIL TODAY!

☐ I would like further information on the Microbore "Design Kit."

☐ I would like a dealer demonstration of the design technique.

NAME _____

STREET _____

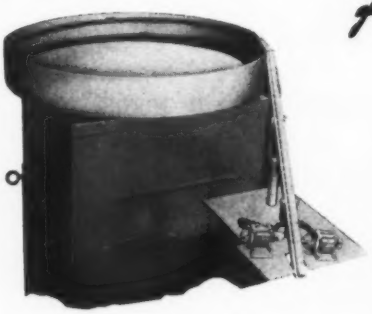
CITY _____ ZONE _____ STATE _____

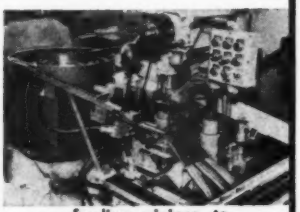
NAME OF COMPANY _____

Orientate and feed parts at controlled rates

Automatically

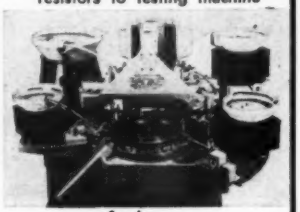
to processing, assembly and packaging operations





feeding pinions to finish honing machine

feeding deposited carbon resistors to testing machine



feeders on automatic assembly

SYNTRON **VIBRATORY**

PARTS FEEDERS

—increase production and lower production costs by handling parts automatically. Eliminate slow, costly hand feeding.

SYNTRON PARTS FEEDERS provide continuous feeding, proper positioning and timing of parts of almost every size, shape and material to assembly, inspection, processing and production line equipment. They are adaptable to most automatic machinery by means of gravity feed tracks with controlled escapements. Each parts feeder is custom designed for parts to be handled.

Send parts samples to our applications engineers for recommendations on your parts handling requirements.

SYNTRON'S years of experience are available to you.

Other SYNTRON Equipment

designed to increase production, cut production costs, improve products

Vibrators (bins, hoppers, chutes)	Rectifiers (Silicon and Selenium)
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Shaker Conveyors	Electric Heating Elements
Vibratory Elevator Feeders	Sinuated Wires
Weigh Feeders	Shaft Seals
Packers and Jolters	Electric Hammers
Hopper Feeders	Concrete Vibrators
Lapping Machines	Paper Joggers

Our representatives will be glad to work with you in selecting the proper equipment for your operation.

Call your nearest Syntron representative

or write for complete catalog . . . Free MW258

SYNTRON COMPANY

341 Lexington Avenue Homer City, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 42

. . . Adhesive from Page 40

peratures. Exposure to temperatures above 212°F for more than 24 hrs will destroy the bond. Exposure to water at temperatures near the boiling point will also destroy the bond. Prolonged exposure to water below 170°F will somewhat weaken the bond but not in a drastic nor permanent way.

CARBIDE TOOLING PRODUCES GOOD FINISH ON INTERRUPTED CUTS

A special 108" marine armature shaft spider assembly, fabricated of 1035 steel, was made up of six individual spider plates welded radially to a center shaft. The machining operations required on it included both shaft step turning and interrupted cuts on the welded spiders.

These operations were performed with carbide tooling on a 48" Monarch Series 90 Dyna-Shift lathe by the Hahn Manufacturing Company.

In spite of the interrupted cuts, Hahn reports surface finsh was 63 rms or better. Although there was no evidence of pounding or gear lash reversal, depth of cut was held to ⅛" to reduce the danger of chips flying from the spider plates.

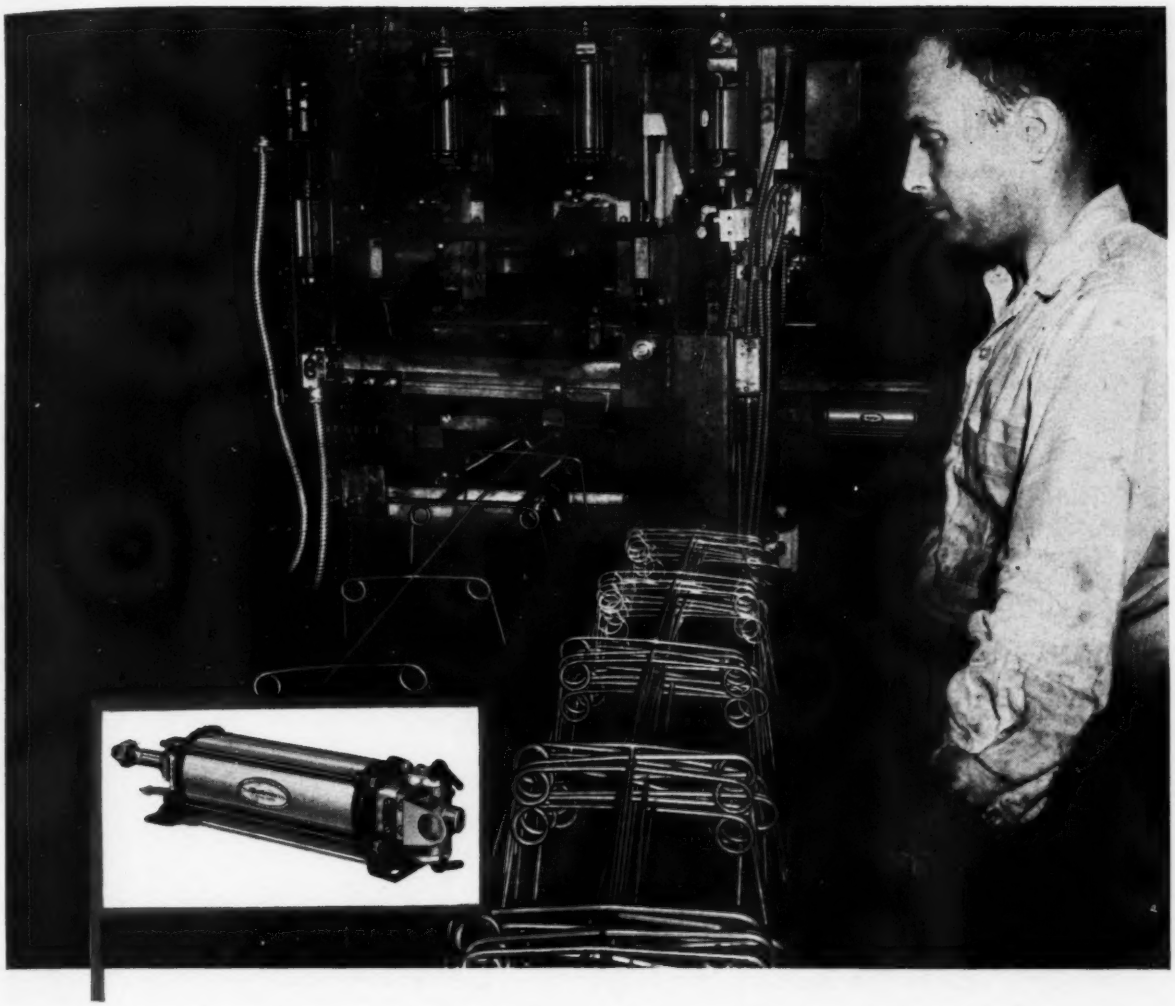
NECROLOGY

W. C. Christianson, 50, general sales manager of Trent Tube Company, a Crucible Steel subsidiary, died suddenly on Dec. 21.

James H. Critchett, a retired vice president of several divisions of Union Carbide Corporation, died Dec. 17 at his home in Orleans, Mass.

F. E. L. Whitesell, who directed Burndy Corporation's sales activities for 20 years, died Dec. 2, at his home in Winter Park, Fla.

Memorial services for Commander Richard K. West, head of West Instrument Corporation and chairman of West Instrument Ltd. of England, were held in December at Glenview, Ill. He was lost while flying his plane over Lake Erie.



THE BELLOWS AIR MOTOR PUTS PRACTICAL AUTOMATION WITHIN REACH OF EVERY PLANT IN EVERY INDUSTRY

Regardless what you make, The Bellows Air Motor can spark cost-saving ideas in the minds of your methods engineers who are looking for practical ways to put automation to work.

Here's a typical case:

The wire reinforcement shown above is an old product. Many companies had made it by hand without change for over 40 years. But Conver Steel & Wire Co., New York, had an idea.

With Bellows Air Motors as the heart, they designed and built a special machine to cut, move, and form the wire. Bellows Air Motors with a single operator now do the work five men did with their hands.

In your operations, too, there are scores of ways in which these ingenious air cylinder power units can be combined with a little imagination to save money. Packing a lot of "controlled power" in a small space, Bellows Air Motors will perform virtually any pull, push, lift or turn motion quicker, safer and more reliably than it can be done by hand or by cams, gears, levers or other mechanical aids. They put practical cost-saving automation within easy reach of every plant in every industry.

Would you like to see a file of cost cutting ideas other companies have developed using Bellows Air Motors? Write Dept. TP-258, The Bellows Co., Akron 9, Ohio.

In Canada: Bellows Pneumatic Devices of Canada, Lt., Toronto 18.

The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

AKRON 9, OHIO 1031-B

CIRCLE INFORM-A-GRAM KEY NO. 43

Don Oberg tells why the Moore Jig Grinder is an absolute must in any good die shop

by **DON E. OBERG**
General Manager
Oberg Manufacturing Co., Inc.
Tarentum, Pa.
Largest Manufacturer of
Carbide Dies

"One of the most important features of an Oberg-built die is guaranteed complete and positive interchangeability of parts throughout the life of the die. *This feature would be practically impossible without the application of Moore Jig Grinders.*

"With Moore Jig Grinders we can accurately locate holes with relation to each other as well as size holes to extreme accuracies. We can efficiently grind contours on carbide die sections which would be impractical by almost any other method. Back taper on contoured carbide die sections and piercing holes can be readily generated on Moore Jig Grinders.

"We feel it would be *practically impossible* to produce the high precision carbide dies required by industry today without the Moore Jig Grinder. *In our opinion it is an absolute must in any better-than-average die shop.*"

As Mr. Oberg points out, the Moore Jig Grinder has no equal on many essential toolroom operations. If you would like a bulletin describing some of the features that make this machine so outstanding, just drop us a line.

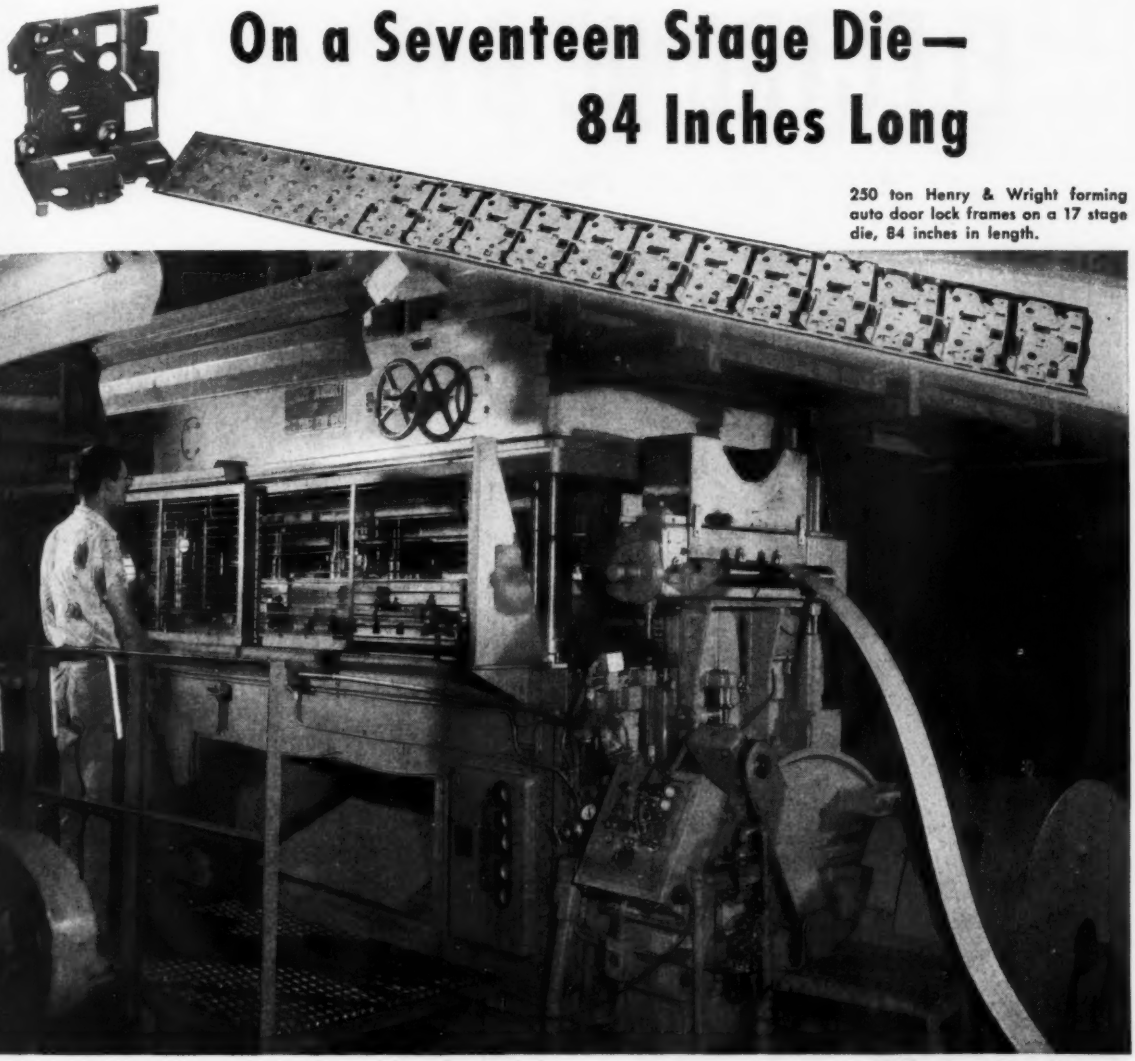
MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut

"The things we like best about our four Moore Jig Grinders are the sturdiness and dependable long-life accuracy built into them. Ours are used ten hours or more every day. Even with this high activity, we have found no apparent inaccuracies from our oldest to our newest machine."

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

80 DOOR LOCK FRAMES per MINUTE

On a Seventeen Stage Die— 84 Inches Long



250 ton Henry & Wright forming auto door lock frames on a 17 stage die, 84 inches in length.

On a Dependable HENRY & WRIGHT Double-Crank Dieing Machine

Long dies and severe off-center loading problems are handled more accurately on a new double-crank H & W dieing machine. It's a matter of the design principle; double-crank, two-point suspension of the H & W machine means better distribution of die loading, and a pulling rather than a pushing stroke on the die. Dies last longer, machine has a lower center of gravity, is stronger and more rigid. Now, you can form larger parts on lower capacity machines than ever before, or produce stampings requiring higher pressures with greater precision and less die wear. Models from 25 to 500 tons capacity meet your every need. Single-crank models also available in sizes to 400 tons. For progressive dieing problems, write or call your H-P-M representative, today.

H823

HENRY & WRIGHT
Built by H-P-M

THE HYDRAULIC PRESS MFG. COMPANY

A DIVISION OF KOEHRING COMPANY • MOUNT GILEAD, OHIO, U. S. A.

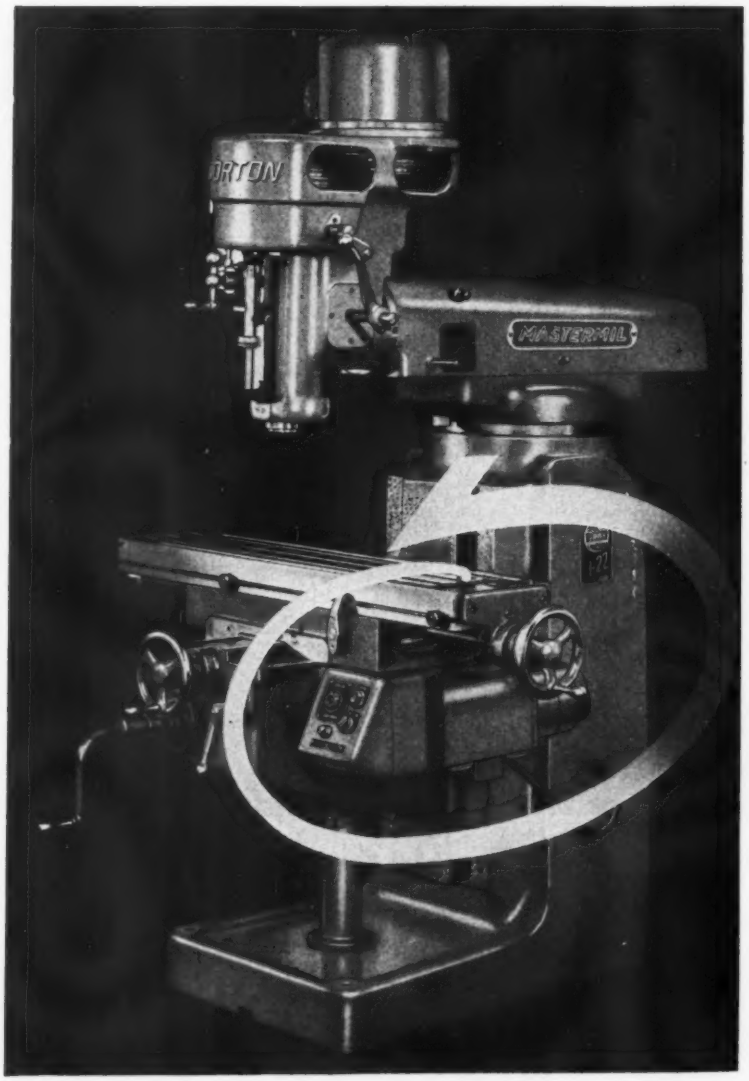
CIRCLE INFORM-A-GRAM KEY NO. 45

For the first time — on any milling machine

ELECTRONIC DYNA-DRIVE

REGISTERED TRADE MARK

THE "TORQUE-THINKING" TABLE FEED



Yours
EXCLUSIVELY
with

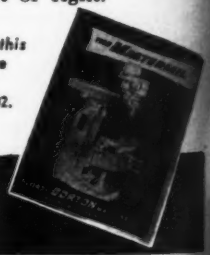
GORTON MASTERMIL

It "feels"... as it feeds

● The exclusive Gorton Dyna-Drive® Table Feed unit "thinks while it works." It automatically adjusts to provide the exact amount of torque required. This electronic "brain" compensates during the cutting operation for small variation in density, hardness and molecular structure of the material being machined. Results are exceptionally fine finish and prolonged cutter life.

The Gorton Mastermil is precision-built throughout, simple, rugged with the finest milling head of any machine in its class. Ram adjusts in and out. Turret revolves and spindle swivels 90° left or right.

Learn more about this remarkable machine by writing for bulletin 2699A—1202.



GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

1202 Racine St. • Racine, Wis.

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A7-1003-1P

CIRCLE INFORM-A-GRAM KEY NO. 46

The FEDERAL "55" gives you OVERSIZE DIMENSIONS

Eliminates the need for larger and more costly equipment! Boosts production on big and bulky jobs!

Here's a press that will handle big, bulky jobs ordinarily requiring larger, more expensive equipment. The new Federal "55" is setting speed and economy records for many manufacturers. When equipped with foolproof air clutch, its speed is increased many times normal operation, safely and with better control. Only the finest components are used in the manufacture of the "55." Timken bearings, solid, web-type V-ways and gibs, oversize crankshafts. Hydraulic recline mechanism is front-operated. Workmanship, as in all Federal Presses, is unexcelled. Available in flywheel or geared types. Mechanical clutch standard. Call your dealer. Write today for catalog.

FEDERAL PRESS COMPANY
807 Division Street, Elkhart, Indiana

Above: No. 55 Flywheel type—55-ton capacity.

Also available: No. 44—35-ton capacity
No. 33—25-ton capacity

FEDERAL *Open back Inclinable* PRESSES

33 Years of Quality Construction

The *EASIEST, FASTEST and CHEAPEST WAY* TO SHARPEN A DIE is to... *PUT IT ON A BLANCHARD!*

The Blanchard method of die sharpening is unequalled for speed, safety and economy. All of the dies shown are sharpened on a Blanchard No. 18 Surface Grinder with equal ease.

The rotary work motion of the Blanchard, with the wheel covering the entire surface at each revolution, enables the operator to remove the amount of stock to sharpen the die and no more! This saves time and increases the life of the die, too.

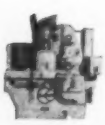
The ample supply of coolant and the ability to use free-cutting wheels permit high grinding speeds without danger of burning the work. This extra speed reduces idle time on the presses.

Many shops use their Blanchards for die sharpening as well as all other surface grinding required in their manufacturing. The 3 Blanchards shown below cover work requirements from finishing tiny gears to roughing steel plates 84" across corners.

Write today for your free copy of WORK DONE ON THE BLANCHARD, Fifth Edition and "the Art of Grinding", Fourth Edition.

BLANCHARD

THE BLANCHARD MACHINE COMPANY
64 State Street, Cambridge, Massachusetts, U. S. A.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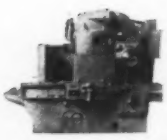
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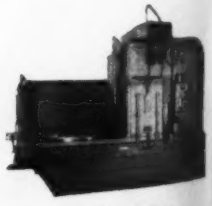
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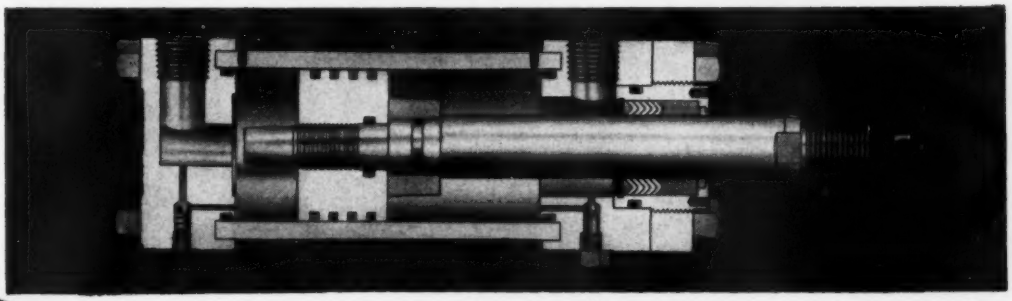
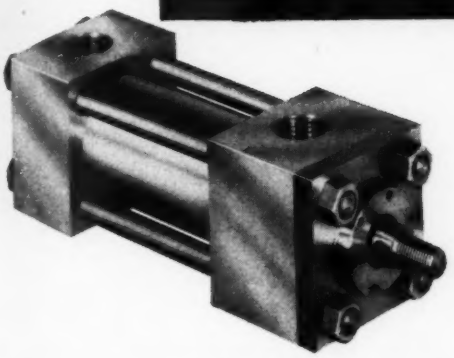
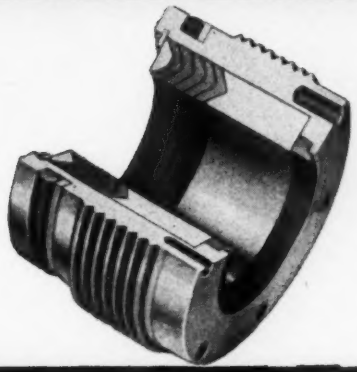
CIRCLE INFORM-A-GRAM KEY NO. 48

O-M a Power-Full Idea in High Pressure Hydraulic Cylinders







O-M *Series TH*
Heavy Duty Hydraulic Cylinders 2000 PSI Shock Loads 3000 PSI Non-shock Loads Meet JIC Standards

Tested, tried and proved powerful components in today's fast-moving automation picture, these ruggedly constructed O-M Heavy-duty Hydraulic Cylinders breeze through heavy work loads, withstand shocks and strains, and provide smooth, dependable power for a wide range of pressures and operating conditions.

Important design and construction features:

1. Head Seal—"O" Ring with leather back-up washer assures positive seal between head and tube.
2. Heads confine tubing O.D. to prevent breathing and thereby provide additional insurance against leakage under the most severe conditions.
3. Heads are counterbored to pilot in accurately honed tubing to assure perfect alignment.
4. Multiple lip, self-compensating, Vee type rod gland packing.
5. Step-cut ring type pistons are standard, but Vee type pistons are available for holding application.
6. Rod gland cartridge is removable for easy maintenance.

O-M Series TH High Pressure Hydraulic (oil) Cylinders are available in full range of sizes (1½" to 8" bores) with standard and heavy duty piston rods.

Mail Coupon TODAY for Bulletin 105 showing descriptive drawings of cylinders, mounting accessories and capacity chart.

ORTMAN-MILLER MACHINE COMPANY
21 143rd Street, Hammond, Indiana

☐ Have representative call
☐ Send Bulletin 105

Name_____ Position_____
Company_____
Address_____
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 49

1st Choice

For Versatility and Adaptability

BULLARD Hydra-Feed Lathes

Rough forging of front axle spindle SAE #1037 Steel, Brinell Hardness 31-32 on the C scale.

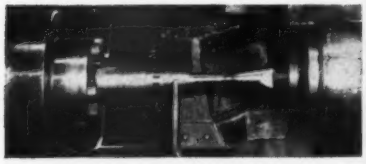
The Senior Engineer at one of the leading motor car manufacturers in Detroit, was looking for a tracer lathe that went beyond his immediate requirement and offered easy conversion to other uses in years to come, to give longest tool life, to do the job with a minimum of shutdown time, to handle future developments in the realm of cutting tools,to reduce scrap to a minimum.

The answer to this multiple problem, according to the Senior Engineer was "BULLARD HYDRA-FEED TRACER LATHES."

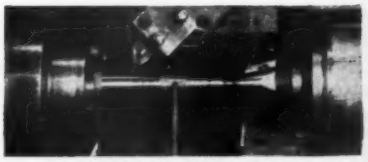
We invite you to investigate the advantages which Bullard Hydra-Feed Lathes, either tracer or multiple tool models, offer you. Phone or write your nearest Bullard Sales Office, Distributor or

THE BULLARD COMPANY

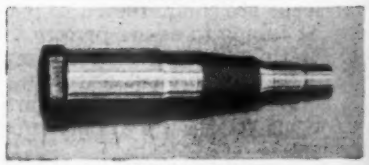
BRIDGEPORT 9, CONNECTICUT



Rough turning with Rear Tracer Slide.



Finish turning with Right-Hand Top Tracer Slide



Finished piece complete cycle time — 65 seconds.

CIRCLE INFORM-A-GRAM KEY NO. 50

Why the Contract Shop Owner Prefers PRODUCTO Die Sets

They help protect his profits

The contract shop owner prefers Producto die sets because they help protect his die performance...his delivery promises...his profits.

The shop owner favors Producto because he can choose from a wide range of die set styles and thicknesses in steel, semi-steel or a combination.

He knows that when his dies are mounted in Producto sets, they will retain the precision built into them. He can expect maximum die life, maximum production with minimum press downtime for regrinding.

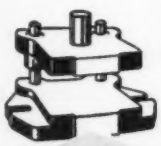
The shop owner likes the fact that Producto offers him a choice of two classes of precision, and that *he pays only for the amount of precision he buys.*

He knows that whoever handles the die will spend the least possible time taking it apart and putting it together because Producto's Qwik-Fit Guide Pins minimize die set assembly problems.

Most important, the shop owner can depend on efficient Producto service and strategically-located Producto distribution centers to protect the delivery promises he makes to *his* customers.

When the contract shop owner thinks in terms of protecting his profits, he thinks of Producto die sets and accessories. You should, too.

NEW DIE SET CATALOG No. 11 is another reason the shop owner prefers Producto. It makes selection and ordering really easy. Write for your free copy today. And ask to receive Die Set Digest, too.



THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut

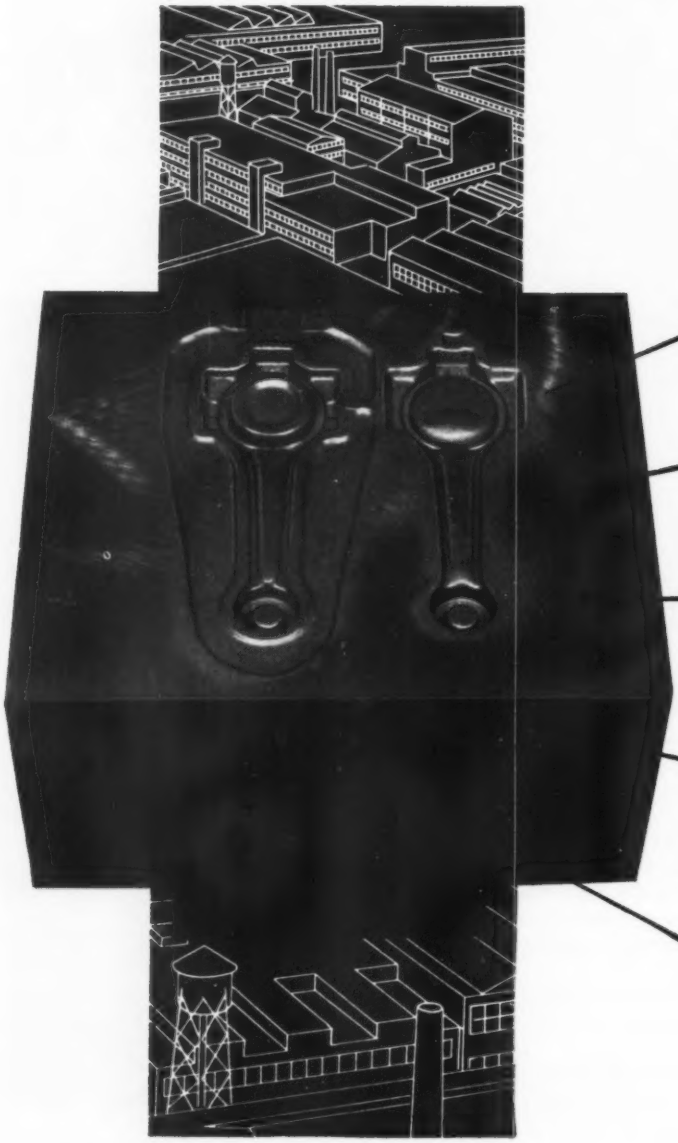
Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

CIRCLE INFORM-A-GRAM KEY NO. 51

...somewhere this forging die is making history!



Both halves of the die were Eloxed in only 50 hours.

Elox equipment used to create the impression costs less than half of conventional tooling equipment.

After washout, Elox equipment will have it back in service in seven hours.

In our Pre-purchase Evaluation division we will demonstrate how Elox can machine the cavities in your closed impression dies at 75% of your present cost. Write or phone today.

10″ Connecting Rod Forging
Max. depth impression: 5/8″
Min. depth impression: 1/16″
Tolerances: + or − .003″

elox* corporation of michigan
* T. M. Reg.

1834 N. Stevenson Highway • Royal Oak 3, Michigan

ELOX keeps you ahead of competition. All forms of Die Making • Form Grinding and Tool Sharpening

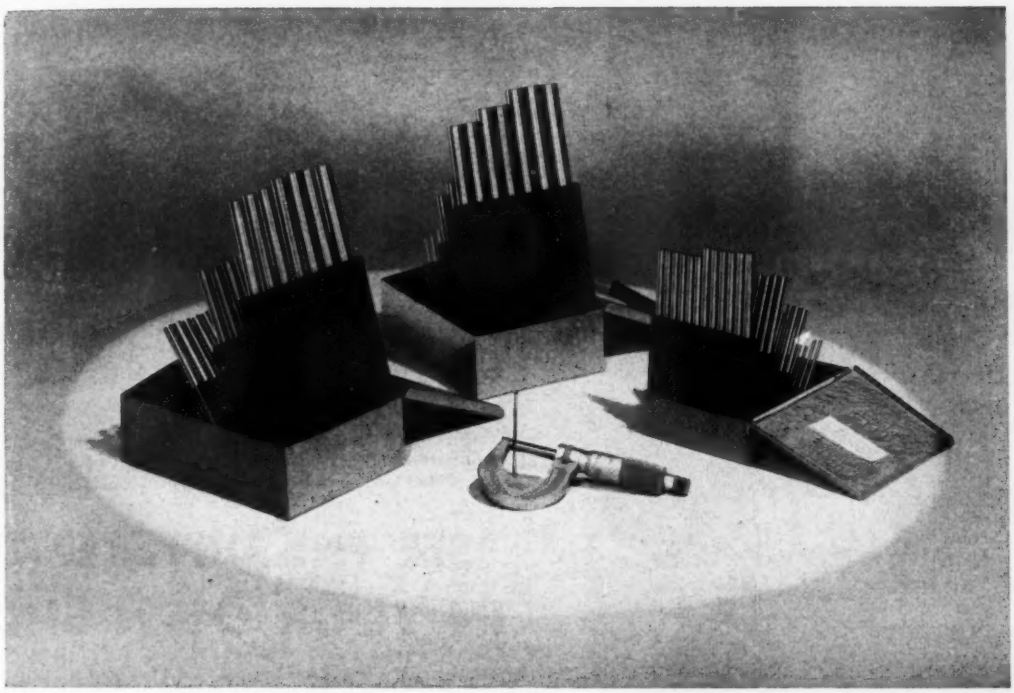
For details on how EDM machining of cavity type dies can prove profitable for you, write for Bulletin P7-1257

CIRCLE INFORM-A-GRAM KEY NO. 52

DRexel 6-4222 ESTABLISHED 1927

WILLIAM T. HUTCHINSON CO.
53 BROWN AVENUE SPRINGFIELD, NEW JERSEY

HUTCHINSON HSS BLANKS



115 Pieces – COMPLETE – .040" to .500" – $88.00

your choice of two tolerances
+ .0002" — .0000
or
+ .0000 — .0002"

JOBBER SET	LETTER SET	WIRE SET
$32.27	$29.03	$27.40
in Huot Index	in Huot Index	in Huot Index

HIGH SPEED STEEL — 64 "C" scale hard — gage tolerance — mirror finish. parallel ground

ANY DECIMAL DIAMETER OF STANDARD LENGTH .020" TO 1.000" SHIPPED ON 24 HOUR NOTICE

CIRCLE INFORM-A-GRAM KEY NO. 53

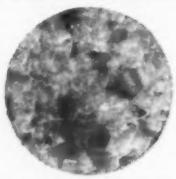
DoALL ACQUIRES WORLD'S FINEST SOURCE OF BLACK GRANITE-*DIORITE* FOR SURFACE PLATES

NO SOFT SPOTS

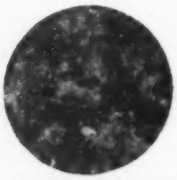
WON'T SCRATCH

BLACK GRANITE

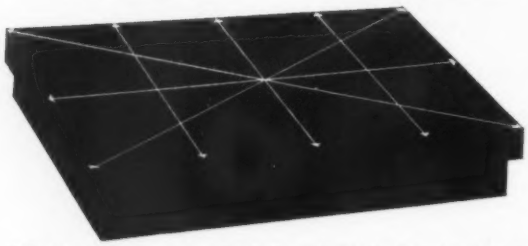
So dense and smooth a scriber can't find soft spots nor will it scratch sensitive acetate. DoALL Black Granite-Diorite is the superior material in all ways. You can see its denser grain structure, compared with pink and gray.



PINK GRANITE



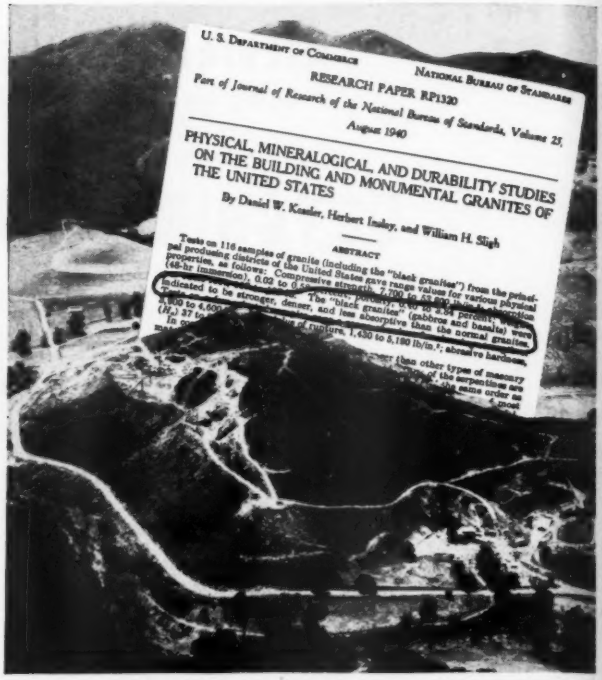
GRAY GRANITE



A better accuracy standard. DoALL Black Granite-Diorite surface plates are specified from an over-*all* mean plane, not per square foot area.

10-DAY FREE TRIAL OFFER!

Prove for yourself in your own plant the superiority of Black Granite surface plates. We will deliver your choice from these four sizes: 8" x 12", 12" x 18", 18" x 24" and 24" x 36".



U. S. DEPARTMENT OF COMMERCE — NATIONAL BUREAU OF STANDARDS

RESEARCH PAPER RP1320

Part of Journal of Research of the National Bureau of Standards, Volume 25, August 1940

PHYSICAL, MINERALOGICAL, AND DURABILITY STUDIES ON THE BUILDING AND MONUMENTAL GRANITES OF THE UNITED STATES

By Daniel W. Kessler, Herbert Insley, and William H. Sligh

ABSTRACT

Home of DoALL Black Granite-Diorite is this Quarry No. 115 near Escondido, California, which the National Bureau of Standards lists in its research paper R.P. 1320 and Fed. Spec. 666-P-463 as the source of finest Black Granite-Diorite.

SEE THE DIFFERENCE IN YOUR OWN SHOP

While granites in general are usually selected as surface plate material over cast iron, much confusion exists as to *which* granite *is the best.*

Different types of granite have varying degrees of soft spots or lack toughness and resistance to wear. Others do not have the density necessary for greatest strength and least porosity, and some types cannot be properly lapped to a fine finish. All of these factors lessen the degree of accuracy obtainable. In its search for better granites, the National Bureau of Standards Research Paper RP-1320 states: "The Black Granites (gabbros and basalts) were indicated to be stronger, denser and less absorptive than the normal granites."

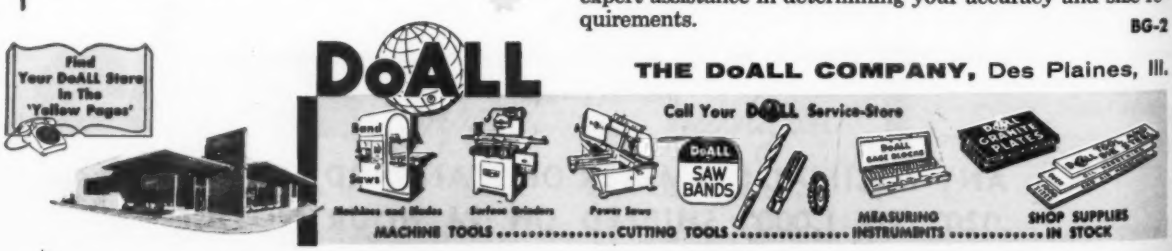
By obtaining the best in granites, DoALL can impart its years of gaging experience to the manufacture of the finest in surface plates.

Take advantage of our *Free Trial* offer to find out why DoALL Black Granite-Diorite is preferred over all other surface plate material.

Call your DoALL Gage Specialist now; he will give you expert assistance in determining your accuracy and size requirements.

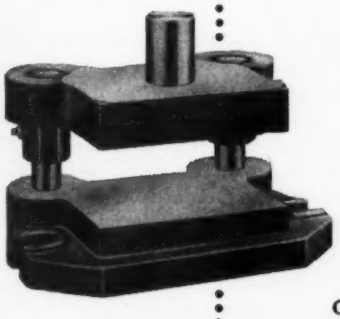
BG-2

THE DoALL COMPANY, Des Plaines, Ill.



They're precision built in every detail for highest production accuracy!

DANNEMAN PRECISION DIE SETS



Notice the details and *see* the difference in die sets! Then you'll know why there are so many loyal Danneman die set customers. Here's what they like about them . . .

- Extra clamping area and increased strength provided by all-around flanging.
- Increased accuracy and **absolute** interchangeability between die shoes and punch holders by precision boring on master plates with Moore special boring machines and De Vlieg boring bars.
- Complete squareness of leader pins and bushings assured by assembly on cylinder square fixtures.
- Parallelism of die shoes and punch holders insured by precision Thompson-grinding on four horizontal surfaces (even the U-lugs are machined for extra clamping accuracy).
- Shank located on center line of die area.
- Leader pins spaced to allow blanks to fall through when press is inclined and still retain maximum stability.
- Even inch increment of die spaces.
- Choice of Lamina precision hardened and ground bushings and leader pins with lubricating devices — or lower cost regular plain hardened and ground steel bushings with grooved guide posts.

Customers know factors like these are responsible for the better quality control, shorter down time, lower cost and higher production obtainable with DANNEMAN DIE SETS. Try them on *your* next high-production job and see the difference *precision in detail* can make! Catalog on request.

DANNEMAN
DIE SET DIVISION

ACME-DANNEMAN CO., INC.
Sales Offices: 45 West 18th St., New York 11, N. Y.
ALgonquin 5-7150 *Works:* 203 Lafayette St., New York 11, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 55

Graph-Mo® dies cut downtime 50% on deep draw for round vacuum cleaner!

ENGINEERS at The Hoover Company had a tough problem in getting that round vacuum cleaner shape in the new Constellation. The two circular dies that form the hemispheres often galled, picking up bits of the steel being formed. This scored the dies, marred the finished parts. Production had to be shut down while the dies were repolished. And extra polishing of the hemispheres ran up costs still more.

After studying the problem, Timken Company metallurgists recommended dies made from Graph-Mo®—a special tool steel developed by the Timken Company. Results were outstanding. The new Graph-Mo dies cut downtime 50%. The combination of free graphite particles and diamond hard carbides in its structure make it outwear other tool steels 3 to 1. Production rolled smoothly and refinishing time was cut.

Graph-Mo machines 30% easier than conventional tool steels. And its uniform response to heat treatment eliminates distortion—saves time and money in lots of tough jobs.

Graph-Mo is one of four graphitic tool steels developed by the Timken Company. If you would like more information about their uses in dies, punches, gages and machine parts, send for the new Timken Graphitic Steel Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

CIRCLE INFORM-A-GRAM KEY NO. 56

Is assembly one of your largest production costs?

It probably is. Wherever fastenings must be made, this simple truth applies: The cost of the fastener is but a tiny fraction of the cost of using that fastener in production. The key to reduced assembly costs is the fastener that helps high-paid assembly hands turn out better work—*faster*. The P-K® Self-tapping Screw is that fastener!

Using screws that don't come up to P-K standards can raise total assembly costs as much as 25%. Screw failures not only result in assembly slow-downs . . . but in parts spoilage and hidden weaknesses as well. This is especially true in assembly by automation. Uniformity, such as P-K Self-tapping Screws offer, is automation's prime requirement for trouble-free assembly.

Why not talk to a Parker-Kalon Assembly Engineer —a man who is in daily contact with many different assembly set-ups. Perhaps he can show you how to reduce the number of fastenings in your product or how to solve a particularly difficult fastening problem. (That's his business.) Contact him through your local Parker-Kalon distributor.

PARKER-KALON DIVISION, General American Transportation Corporation
Manufacturers of Self-tapping Screws, Socket Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws

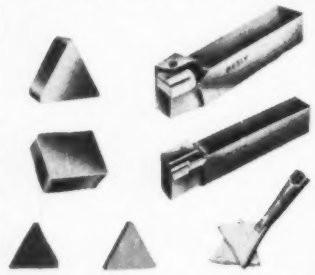
PARKER-KALON® fasteners

Sold Everywhere Through Leading Industrial Distributors
Factory: Clifton, New Jersey—Warehouses: Chicago, Illinois—Los Angeles, California

CIRCLE INFORM-A-GRAM KEY NO. 57

BESLY *Complete* CARBIDE SERVICE

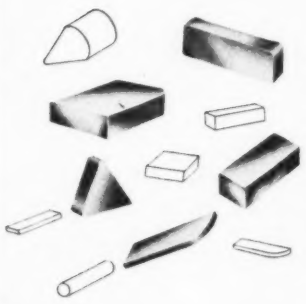
Lapped TOSS-AWAY INSERTS and HOLDERS



Commercial Finish | Besly Finish | Lapped, perfectly flat surfaces easily wring together.

Special Besly lapping process gives more tool life per cutting edge with less chipping and breaking. Wide range of sizes, positive and negative rakes. Holders in styles and shank sizes to fit the job.

BLANKS



In sizes, grades and styles for every cutting need. Standards include: reamer blanks, lathe center blanks, rectangular strips, solid cylinders, pulley grooving blanks and others. "Specials" made to order.

TIPPED TOOLS

Standard tools supplied in a variety of grades, sizes and styles for turning, facing, boring, chamfering, planing, milling, end cutting, threading and grooving in cast iron, non-ferrous, steel and steel alloy metals. Modifications and "specials" made to fit specific jobs.

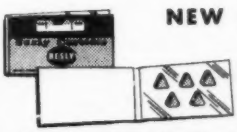
only tools with perfect radii...

...means that BESLY carefully makes every Carbide Tool to the highest standards of **accuracy** and **quality**

Only the best materials and methods are used in their development — advantages which give you longer life, less downtime, fewer rejects and higher production rates at lower cost.

A complete range of standard styles and sizes is always available for *overnight delivery* through your Besly distributor. Ask him for Catalog 857 and for Besly's super-service on "specials."

NEW PACKAGING



Skin-Pak for Inserts and Blanks

Lapped toss-away inserts, carbide blanks, in standard package quantities, are conveniently arranged on 3" x 5" file card size fold-over cardboard pack secured with transparent polyester film for complete protection. Besly's new package prevents chipping of cutting edges and insures perfect condition, ready for instant use.

Plastic-Pak Cigarette Box for Tipped Tools

Standard tools inserted in Styrofoam and packed in individual, attractive plastic "cigarette" boxes. Provides easily identified, handy, fully-protected tool packages always ready for use.

SEE YOUR BESLY DISTRIBUTOR OR WRITE FOR CATALOG 857

BESLY

Engineering, Service and Specials . . . are a Besly specialty

BESLY-WELLES CORPORATION

Est. as C. H. Besly & Co. 1875

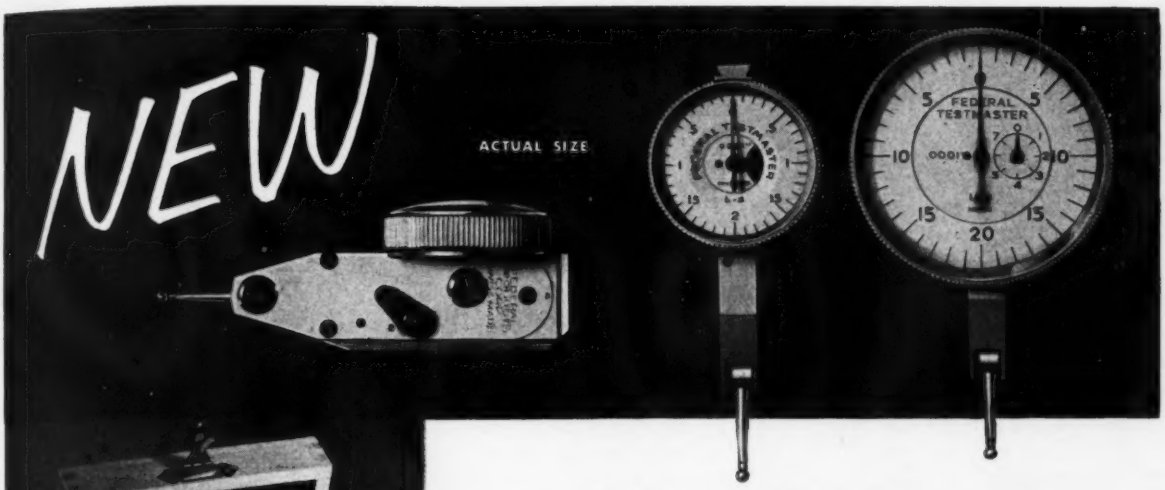
128 Dearborn Avenue, South Beloit, Illinois

GRINDERS and ABRASIVES • TAPS • X-PRESS TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES • CARBIDE TIPPED TOOLS, BLANKS, LAPPED TOSS-AWAY INSERTS and HOLDERS

CIRCLE INFORM-A-GRAM KEY NO. 58

NEW

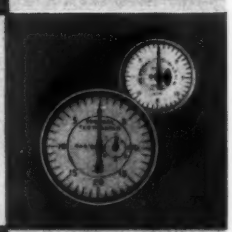
ACTUAL SIZE



INTEGRAL DOVETAILS make mounting more versatile and secure (An exclusive Federal feature).

LARGE DIAL MODELS also available in both horizontal and perpendicular styles.

EASY-TO-READ PRECISION DIALS . . . crisp, clear-cut graduations.



CLUTCH-MOUNTED CONTACT (180° rotation) and easy-to-use REVERSING LEVER.

The long range, high magnification

FEDERAL TESTMASTER

8 new models SWISS MADE to the highest FEDERAL Standards

Now, the most imitated test indicator of all time . . . the Federal Testmaster, adds eight new models to its Series, all made to the highest Federal standards by Swiss craftsmen and all immediately available. These new models, too, will be imitated but never equaled. Beware of look-alikes and imitations.

- These new Federal (Series L) Testmasters have up to *four times the range* you'd expect in a test indicator. The four models with .0005" graduations have .060" range. The other four models (.0001" graduations) have .032" range.
- Despite this longer range, the new .0001" Models have at least *twice the magnification* of other type test indicators. Range per revolution is .004".
- *Even greater magnification* (50% more) if you select the large dial models in this new Testmaster series. They are available in .0001" and .0005" graduations and in regular or perpendicular styles (as are the more compact, smaller dial models).
- Many other features . . . integral dovetails for convenient and positive mounting . . . easy-to-use reversing lever . . . clutch-mounted, interchangeable contact . . . velvet-smooth operation . . . BALL BEARING PIVOTS for low-friction, truly accurate motion transfer.

FOR THE WHOLE STORY ON THESE NEW FEDERAL TESTMASTERS ASK FOR BROCHURE.

FEDERAL PRODUCTS CORPORATION
8232 Eddy Street, Providence 1, R. I.

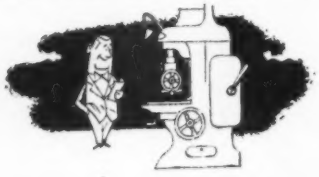
Ask FEDERAL *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .
Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

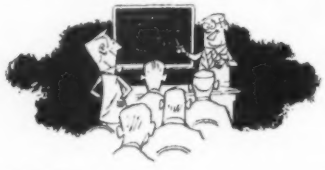
CIRCLE INFORM-A-GRAM KEY NO. 59

ATTEND THE
1958
ASTE
TOOL SHOW
CONVENTION CENTER
PHILADELPHIA MAY 1-8

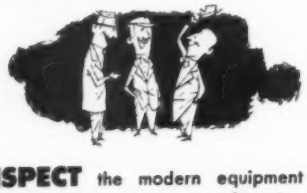
SEE all the very latest advances and improvements in more than thirty major categories of industrial products.



ATTEND top-level conferences, conducted by recognized authorities on the newest production techniques and developments.



MEET and exchange ideas with management, engineering, production, sales people from the nation's leading industrial concerns.



INSPECT the modern equipment and up-to-the minute manufacturing methods being utilized in booming Delaware Valley plants.

AMERICAN SOCIETY
TOOL SHOW * CONFERENCE '58 MAY 1 TO 8
OF TOOL ENGINEERS

Coming Events

Feb. 4-6. Society of Plastics Industry. 13th Annual Technical & Management Conference. Edgewater Beach Hotel, Chicago.

•

Feb. 6-7. Malleable Founders Society. Technical and Operating Conference. Wade Park Manor, Cleveland.

•

Feb. 6 & 27; Mar. 7. Conforming Matrix Corporation. Technical Clinics on Spray Decorating Techniques. Feb. 6 — Hotel Claypool, Indianapolis. Feb. 27 — Hotel Biltmore, New York City. Mar. 7 — Hotel Statler, Hartford, Conn.

•

Feb. 7-8. American Society for Quality Control. Administrative Applications Division. Annual Conference on Management by Exception. Hotel Carter, Cleveland.

•

Feb. 16-20. American Institute of Mining. Metallurgical and Petroleum Engineers Annual Meeting. Hotels Statler & Sheraton-McAlpin, New York.

•

Feb. 17. Cleveland Engineering Society. Factory Management and Maintenance Division. All-Day Cost Reduction Conference. Cleveland (Ohio) Engineering Society.

•

Feb. 18. Rochester Society for Quality Control. 14th Annual Quality Control Clinic. War Memorial, Rochester, New York.

•

Feb. 24-26. Association of Iron and Steel Engineers. Western Meeting. Hotel Statler, Los Angeles.

•

Mar. 3-5. American Management Association. Electronics Conference and EDP Equipment Exhibit. Statler Hotel, New York City.

•

Mar. 3-6. American Society of Mechanical Engineers. International Gas Turbine Power Division Conference and Exhibit. Shoreham Hotel, Washington, D. C.

•

Mar. 11-12. Pressed Metal Institute. Spring Technical Meetings. Sheraton-Cadillac Hotel, Detroit, Michigan.

•

Mar. 17-18. Steel Founders Society of America. 56th Annual Meeting, Drake Hotel, Chicago, Ill.

•

March 17-21. Engineers Joint Council. Nuclear Congress. International Amphitheatre and Palmer House, Chicago.

MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

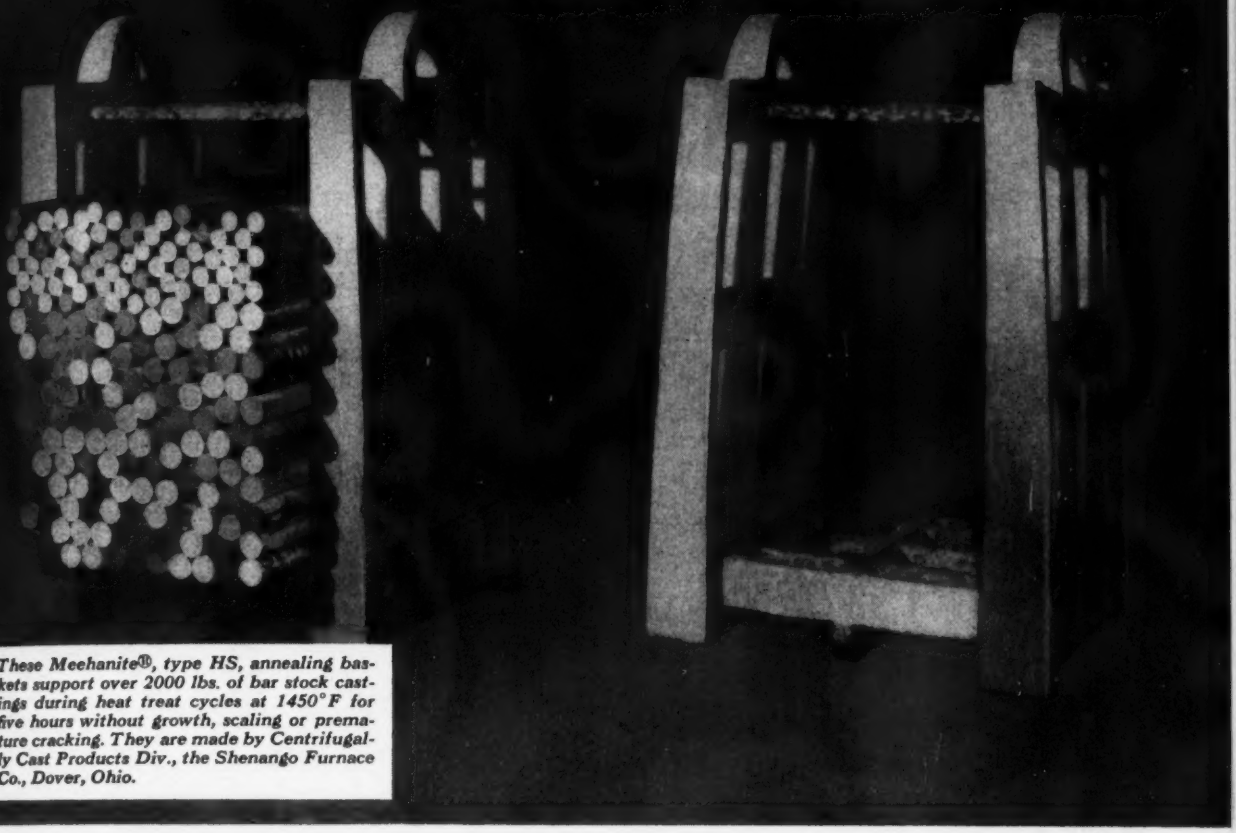
The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
E. W. Bliss Co., Canton and Toledo, Ohio
Centrifugally Cast Products Div., The Shenango Furnace Co., Dover, Ohio
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
Empire Pattern & Foundry Co., Tulsa, Okla. and Bonham, Texas
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machines Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundries, Inc., Chicago, Ill.
The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Nordberg Manufacturing Co., Milwaukee, Wis. and St. Louis, Mo.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
The Prescott Co., Menominee, Mich.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Industries, Inc., Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Valley Iron Works, Inc., St. Paul, Minn.
Vulcan Foundry Co., Oakland, Calif.
Washington Iron Works, Seattle, Wash.
Dorr-Oliver-Long, Ltd., Orillia, Ontario
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

WRITE TODAY FOR YOUR FREE SINGLE COPY OF THIS INFORMATIVE BULLETIN.

BEHAVIOR OF CASTINGS AT ELEVATED TEMPERATURES — *BULLETIN TD-7*

CIRCLE INFORM-A-GRAM KEY NO. 61

HEAT RESISTANCE



These Meehanite®, type HS, annealing baskets support over 2000 lbs. of bar stock castings during heat treat cycles at 1450°F for five hours without growth, scaling or premature cracking. They are made by Centrifugally Cast Products Div., the Shenango Furnace Co., Dover, Ohio.

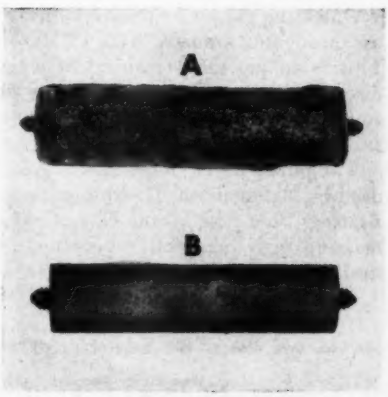
Heat resisting Meehanite castings provide dependable service at high temperatures

Metal parts subjected to high temperatures undergo dimensional and structural changes which can lead to premature cracking or surface disintegration and scaling. These serious causes of failure can be avoided by selecting materials capable of withstanding the specific heat stresses involved.

The stabilized structure of Meehanite metal is particularly suitable for engineering applications where components must function dependably under steady or cyclic high temperature conditions.

This dependability of Meehanite® at elevated temperatures has led to its acceptance as a standard material for annealing pots, dies and fixtures, ingot molds, stoker parts, steel mill furnaces, smelting, cement and roasting furnaces, tube mill furnace rolls, incinerator liners, etc.

There are ten types of heat-resisting Meehanite metals available from which selection can be made according to conditions of service at high temperatures. For more detailed information write for a copy of our new, 4 page bulletin TD-7 — "Behavior of Castings At Elevated Temperatures" — or call the Meehanite foundry nearest you.



Test casting A, made from alloy gray iron was heat-treated for 300 hours at 1700°F in an oxidizing atmosphere. Severe growth and scaling is evident. Casting B, made from SC Meehanite® was given the same heat test. No growth or scaling occurred.

MEEHANITE BRIDGES THE GAP BETWEEN CAST IRON AND STEEL®

MEEHANITE METAL

MEEHANITE METAL CORPORATION, NEW ROCHELLE NEW YORK

CIRCLE INFORM-A-GRAM KEY NO. 61

DROODLES

by ROGER PRICE

J&L

O
E. E.
M. E.
Ph. D.

"THREE DEGREES BELOW ZERO"

As a man who has steadily shunned all degrees except honorary ones (I'm still waiting for somebody to speak up) I feel well qualified to discuss the subject. And even though I myself am a prominent scientist—Sec'y.-Treas. of the Lower Bronx Astronautical Society—I must admit I don't think degrees are very important. Of course, my viewpoint might change. Especially if I can wheedle some college into awarding me a Ph.D. (Phenomenal Droodlist). Ah, well, who can tell what the future will bring?

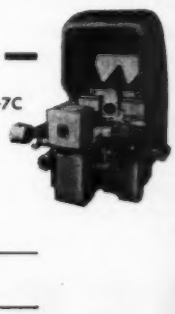
One thing the future is sure to bring is the increasing use throughout industry of the J&L Optical Comparator. This is an ingenious instrument which measures and inspects all sorts of parts and objects laterally, vertically and angularly—it also inspects by reflection, by tracing and from overhead—with speed and precision (to .0001").

The photo above shows how a J & L Comparator is used by National Seal Division of Federal-Mogul-Bower Bearings, Inc., Redwood City, Calif., to inspect and measure high precision rubber moldings. Due to the flexibility and shrinkage of the parts, accurate measurement can be made only by means of the Comparator. Using reflected light, the Comparator visualizes the actual manufacturing process. That is, the cross section inspection at 20X of the moldings themselves. Based on this inspection, the molds are approved. Periodically, as a check, production parts are measured and compared in contour to the same chart outline. Thus the Comparator acts as a monitor, and reduces scrap before it starts.

Jones & Lamson makes the Comparator in eleven models, ranging from a 7" Bench type to a 30" floor model. For complete details, send this coupon *today.*

"The originator of machine tool standards in optical inspection"

JONES & LAMSON



Bench Model BC-7C

JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vt., U. S. A.
Please send me Comparator Catalog 5700, which describes the complete line of J & L Optical Comparators.

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company _____ city _____ zone _____ state _____

386

CIRCLE INFORM-A-GRAM KEY NO. 62

"Commendable Comments"

"One of the most serious problems confronting both us and industry in reaching our missiles objectives is the factor of reliability. Unless the missile can be depended upon to do its job within an acceptable range of predictability, it is less than worthless. We have been aggressively fostering a program of reliability throughout the entire industrial structure to raise the standards of performance and durability, in order that we can increase the reliability of these weapons. We are asking all of the manufacturers involved to review very closely their quality control and testing procedures to assure that the standards are raised. To achieve the quality and consistency of performance that we need, it is imperative that much more extensive environmental and actual usage type of testing be carried out by the components and parts manufacturers."

—Brig. Gen. Beverly H. Warren, deputy director of Production, Air Materiel Command, addressing an Industrial Clinic.

"The more complicated become the tools at man's disposal, and each technological advance increases their complexity — the more important man's role becomes in their application and use. It is my opinion that, far from becoming robots, man will become more individualized with the progress of technology."

—William F. Hufstader, vice president, General Motors Corp., Distribution Staff, addressing the Detroit Roundtable of the National Conference of Christians and Jews.

"Far better quality control engineering systems will be required for the automation of the future, to determine the quality-ability of new designs prior to the start of production. Automation also will require tighter promation also will require tigher process controls of incoming material quality and over in-process quality. It will require more effective quality information devices of the feed-back control variety. And most important, it will require intensive effort in the development of high calibre manpower to insure success of the program."

—Dr. A. V. Feigenbaum, manager of quality control, General Electric Company, addressing American Management Association Seminar on Quality Control.

with the "ALSOP METHOD" of

SUB-MICRON FILTRATION

The following cost reductions are substantiated by "in shop" tests:*

1. Increased production
2. Improved finish and controlled accuracy of work pieces
3. Reduction of coolant waste
4. Elimination of systems cleaning
5. Abatement of dermatitis in workers
6. Improved machine cleanliness
7. Prolonged accuracy of tools
8. Longer tool or abrasive wheel life expectancy
9. Reduced wheel loading and wheel dressing
10. Maximum recovery of precious (diamond) swarf
11. Reduced swarf handling and shipping costs
12. Reduction in parts cleaning costs

The "ALSOP METHOD" of sub-micron filtration on coolants, cutting oils and hydraulics is obtained with compact—large area—volume capacity units.

May we have our representative call and discuss a trial demonstration in your plant? No obligation of course.

A request on your letterhead will open these avenues for you.

*Engineering Bulletins on Request

ALSOP ENGINEERING CORPORATION

1302 Andrews Street Milldale, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 63

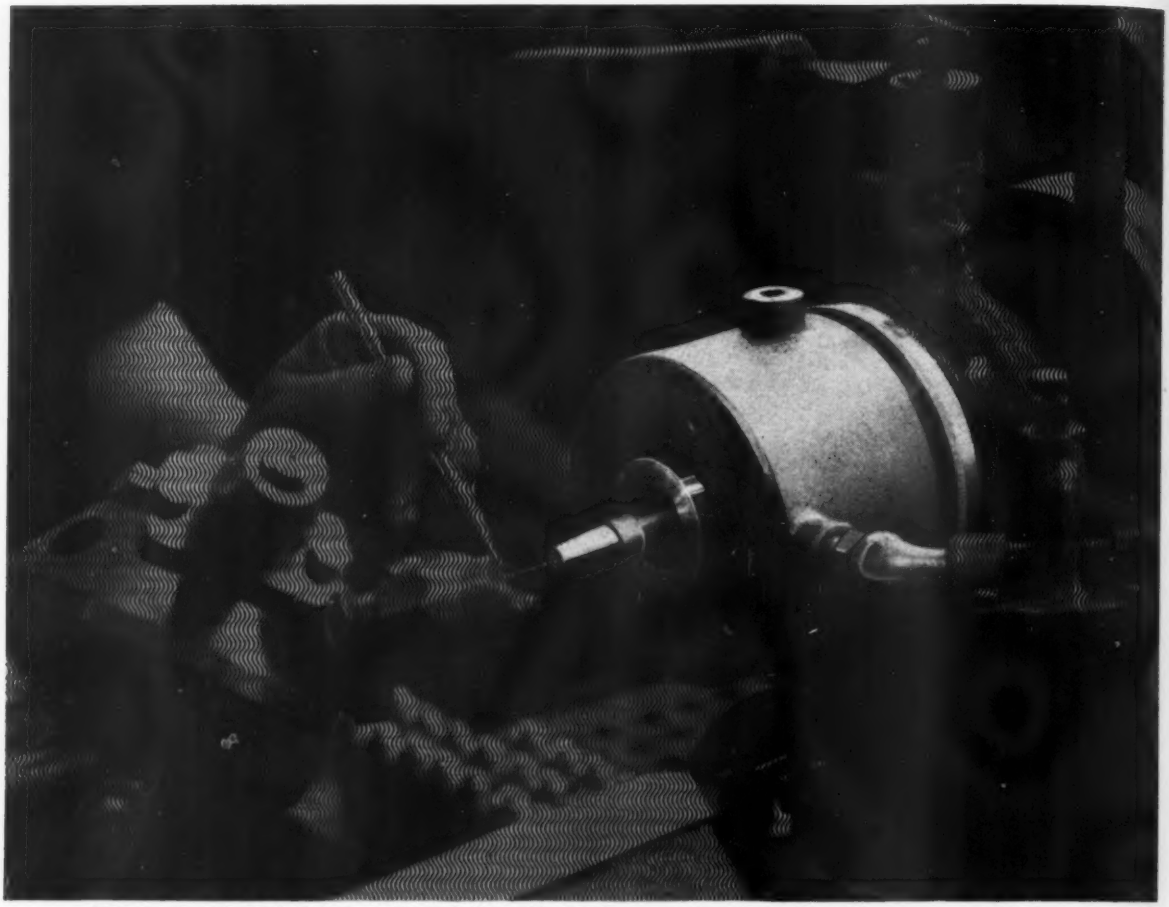
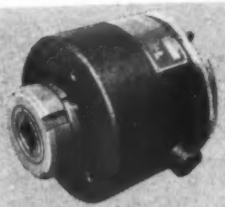


Photo: *Courtesy Harris Calorific Company, Cleveland, oldest and largest independent producer of gas welding and cutting equipment in the country.*

ERICKSON AIR CHUCKS

a hot tip for cutting costs on cutting-torch tips



Erickson '09 Model Air Chuck for heavy work. Quick-acting air chuck, with leverage principle, gives 3 to 4 times holding power of ordinary chucks.

"We have used Erickson Chucks since 1942 . . . and would recommend Ericksons to any plant which wants to increase production . . ." That is the report from Harris Calorific Company, big-name manufacturer of gas cutting and welding equipment.

The company uses four No. 400 Erickson Air Chucks for finishing leaded copper cutting-torch tips. Operations consist of drilling, reaming and polishing—at the rate of approximately *100 pieces per hour per chuck*.

Compared to previous methods, Harris Calorific Company claims, trueing-up time has been cut 70% . . . chucking time 60% . . . set-up time 25%.

Let an Erickson representative show you how to cut your production costs—*accurately*—with Erickson Air Chucks.

AA-5709

Bothered by a tough holding problem? Then let us show you how Erickson holding tools speed production, lower costs. Call us or write for Catalog K.

ERICKSON TOOL COMPANY

34351 - 2 Solon Road • Solon, Ohio

COLLET CHUCKS
FLOATING HOLDERS
TAP CHUCKS
TAP HOLDERS
AIR-OPERATED CHUCKS
EXPANDING MANDRELS
EXPANDING-COLLETS
SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 64

Stay Equipped to Survive

THE MONTHS IMMEDIATELY ahead of us will be exceedingly trying ones for some companies and for the men who operate their plants; but, also, it will be a period of opportunity for those with unusual courage, resourcefulness, wisdom, and fortitude.

The fittest will survive, but such survival or increased competitive standing will be the result of a continued, studied program of action.

Fortunate is the company that had long enough ago installed a systematic approach to economic equipment analysis for scheduled replacement of profit-losing machine tools, presses, and other production equipment. Such a company, if it hasn't exhausted all of its cash reserves and borrowed heavily to boot to finance sizable expansion of its physical facilities, is in an admirable position to weather the storm. It has modern equipment able to turn out quality work at the lowest possible expense. If it has been or is forced into a reduction of work force, the remaining employees are shifted to equipment that can provide optimum production. I hope your company is in this position, because unfortunately many companies aren't.

This is not the time to abandon any program for planned machine tool replacement. With such a program you have a competitive margin that is priceless and needs to be maintained. A strong competitor may have been listless in recent years and neglected to keep its plant up-to-date; it may have the reserves or the access to recapitalization dollars to now repair its fences and emerge in a better-than-ever condition to increase its percentage of available business. The machines it buys now will probably be superior to what you acquired 2, 3, 4, or 5 years ago. New machine models, capable of greater accuracy and faster production rates, are constantly being introduced.

Neither is it the time to postpone setting up a program for economically determining a choice between machine tool retention and replacement, or between repair and rebuild. The key to your plant's emergence from '58 in a healthy condition may rest in your courage and wisdom in spending limited dollars during this period.

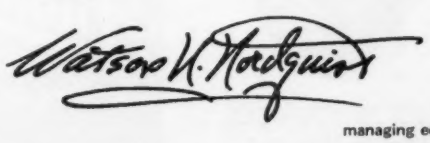
Marketing departments are dreaming up elaborate schemes as market stimuli. These include the introduction of new products, new materials, new design features. During the months ahead they will emphasize higher quality, faster delivery, more versatility in handling contract work. Is your plant equipment adequate to such demands? Your competitor's may be.

Your company may see its success in a shedding of unprofitable lines, in adding others that are more marketable and more profitable, in greater diversification. This may necessitate machines more versatile than you have now. Success may lay in the plant's ability to economically produce missile or other aircraft components from the new high-temperature, high-strength materials. You may need machines with higher horse, greater rigidity, *constant* spindle speeds, or other features.

Your company, or the company you are supplier to, may stake its competitive future on the development of greater market sensitivity — the ability to move fast with new models or new products to meet the impact of a competitor's new product. Fortunate will be the company that can tool up quickly, that has toolroom equipment which is modern, versatile, and fast and which will keep lead time to a minimum.

But, most of all will be the increased demands for quality standards virtually unknown in the past. In a buyer's market, the buyer becomes more discriminate. The limited dollars he has prohibits his buying a product only to plough more money into it in subsequent repair or modification. The nation expects greater reliability in its missiles, and therefore, greater reliability of the thousands of components that go into one. Similarly, the nation — all of the people in it — expects consumer products that are of greater reliability and of higher performance characteristics. No manufacturer can afford to deliver such quality by rejecting a high percentage of his production or by countless hand finishing operations. He can better afford production equipment that will initially deliver work to the precise dimensional and finish standards demanded.

The return on capital invested must not be ignored, nor the limited funds available for investment. But neither can be ignored the risk of equipment being totally inadequate or too productive of excessive manufacturing costs.



managing editor

GUIDE PINS and GUIDE PIN BUSHINGS

Because high production, quality control and longer die life have become all-important, most stamping plants have now standardized on Lamina guide pins and Lamina bronze-plated bushings.

All Lamina wring-fit bushings are pre-finished on the I.D. Seated on a ground shoulder square with the surface of the die shoe and secured by special retainers, they assure distortion-free, full bearing surface that results in better die alignment, less maintenance and longer die life.

Lamina guide pins are special tool steel, heat treated, spray quenched, ground and burnished. The uniform, hard surface resists wear and the tough core prevents bending during installation or use. The pins are dimensionally accurate, do not "mushroom" or get out of round, and require no "running in".

There is a type and size Lamina Guide Pin and Bushing for every need. Our new catalog gives illustrations, applications, dimensions and prices of more than 800 items. Write for free copy.

LONG SHOULDER TYPE—Small toe clamp. Use to keep guide pin in bushing during stroke. Long wearing bronze plated on hardened steel, ¾" to 3" pin dia.

HEAVY DUTY—Large toe clamp, for large and heavy die sets requiring extra body and shoulder thickness. Bronze plated, 2" to 3" pin diameter.

NUT TYPE—For wide range of requirements. Available in 5 sizes, 1" to 2" pin diameter, long-wearing bronze plated on hardened steel.

LONG SHOULDER TYPE—Large clamp. Long bearing surface contains pin during entire stroke. 2" to 3" pin diameter. Bronze on steel.

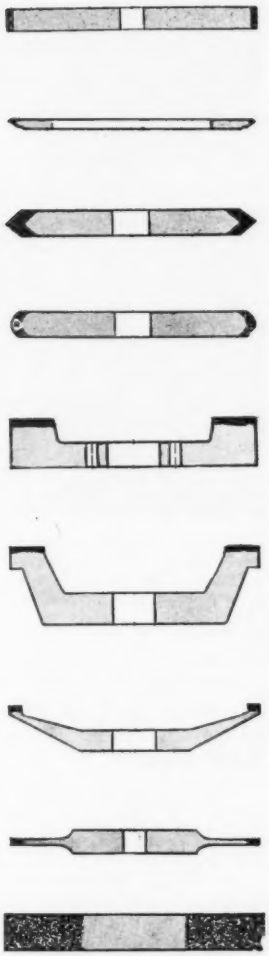
SHORT SHOULDER TYPE—For die space, more bearing area within die area. Bronze on steel or solid Ampco Bronze. 7 lengths, pin sizes ¾" to 2".

RING CLAMP TYPE—For heavy duty and bossed die sets. Bronze-plated steel or Ampco Bronze, 4 lengths, pin diameter 2½" to 4½".

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

A TOOLING & PRODUCTION SPECIAL REPORT:

IN-PLANT 'DIAMOND MINES' ARE EXPENSIVE ... SPOT YOURS AND SAVE



Proper use and conservation of diamond wheels and trueing tools saves money and diamonds. Improper use is wasteful and expensive. Find your 'mine' and tap it.

by Carol E. Reuss
Associate Editor

DIAMONDS ARE IMPORTANT PRECISION TOOLS . . . and their importance and increased use will continue to rise as more complicated parts of harder materials, requiring more precision grinding, are dropped into manufacturing's lap. Conservation of diamonds goes beyond the diamond Syndicate's import limits and General Electric's ability to produce man-made diamonds. It touches two vulnerable spots — the pocketbook . . . particularly now when cost cutting programs are often the key to profits and survival, and the available supply of diamonds for handling increasing applications and needs. In times of national emergency, limited supply resulting from lowered diamond imports adds fuel to the diamond conservation fire. Now, however, consider the economics alone: It just doesn't make sense to use carelessly such expensive and valuable materials as diamonds.

Approximately 9-million carats of industrial diamonds — stones and bort — were used by U. S. industry last year. End uses included diamond wheels, shaped diamond tools, trueing tools, wire dies, diamond core drills, and diamond compounds. Most of this was for what General Electric's Dr. Guy Suits calls "premium applications," because "industry can't afford to use $7,000-$9,000/lb material for applications which require only 50¢/lb abrasives." But, premium applications are increasing: Consider the manufacturing and/or grinding requirements for high speed, high strength aircraft, as just one example. Consider increasing use of carbide tools, dies, and wear-parts as another.

More than half of the diamond yield from blue ground, or diamond-bearing rock, ends up as industrial diamonds and bort — 2½ carats of the approximately 4½ carats found in 35 tons of blue ground. Most of this is bort, from which grinding wheels and lapping compounds are produced. As a result of this and also as a result of industrial needs, the greatest end use of diamonds is for grinding wheels — specifically for grinding carbides. By the same token, the greatest diamond conservation possibilities lie within the realm of grinding. So, says Carborundum Company's John W. Ripple, "a vigorous program of conservation and salvage of diamonds used in diamond wheels can save money for the user, real money if the wheels are used in appreciable quantities." Proper use, in his estimation, is Number One on the conservation list.

Diamond specialists gave the following suggestions for conserving bort about five years ago, when the government restricted diamond use and all industry joined efforts to decide on ways and means of conservation. They are still valid and valuable today.

• More efficient use of diamond wheels in conventional grinding by employing conditions which result in

Fig. 1. Carbide and ceramic tool grinding are important uses of diamonds, and likewise important areas of potential savings through proper use and conservation. This wheel is typical of the many diamond wheels used for tool grinding, except it is made of G.E.'s man-made diamonds.

the largest possible amount of stock removal per carat of diamond.

• Substitution of silicon carbide abrasive wheels for diamond wheels, where possible.

• Consideration of non-conventional "grinding" processes developed to procure greater stock removal per carat of diamond.

A fourth suggestion — use of abrasive belt methods for grinding carbides — was the result of efforts of abrasive belt and machine manufacturers to find a way to substitute for diamonds which were in extremely short supply. Many machines sold for belt finishing carbide tipped tools are still successfully in use, but the idea didn't take too strong a hold as a full-range substitute for diamonds. As long as diamonds are available, a Behr-Manning spokesman believes, "they hold the dominant position for tool grinding." Diamonds are more economical than coated abrasive belts, he adds, for carbide tool finishing.

Limiting the conservation problem to carbide tool grinding, consider this data: It has been estimated that it costs between $20 and $30 to grind a cubic inch of carbide. To cut this cost, or to hold it at a minimum, takes 1) proper wheel selection and application, 2) proper use of coolants, 3) good machines, and 4) an effective diamond salvage program. Diamond salvage and "wet" grinding each can account for at least a 10% savings in wheel cost. It is smart to examine all facets of a diamond grinding program to spot all the money- and diamond-saving possibilities.

Because of diamond's unsurpassed hardness it is sometimes the only material which can be used to shape other hard materials. In other instances, the diamond is overly-used, and can be replaced economically and acceptably by different materials and/or methods without endangering finished product quality. In general, it is reasonable to assume that any technique that saves diamonds — whether by lengthening their useful life, or by replacing them with acceptable results insofar as the finished product is concerned — is a conservation method and should be followed. Proper selection and efficient use of the various types and grades of diamond wheels is a first step in the diamond conservation program.

Basically . . .

No one diamond wheel can do all things for all grinding operations. Economical selection depends on many things, including available equipment, availability or non-availability of adequate coolant, the grinding job itself, and the special features of each of the various types of wheels.

Reviewing the basic principles of abrasive and diamond wheels, we find that:

Concentration is the ratio between the diamond particles and the bonding material: For carbide grinding three concentrations are recommended: 100 concentration, giving maximum number of diamonds; 75 concentration; and 50 concentration. Some wheel manufacturers speak only in terms of 100 and 50 concentration. One recently introduced a 150 concentration wheel! The actual number of diamonds to bonding material is not fixed, but varies among wheel manufacturers, which makes it difficult to compare wheels fully and adequately.

Grit size is the diamond particle size. A survey of diamond wheel manufacturers indicates that grit sizes are as follows for carbide grinding:

80 grit — very coarse, for heavy stock removal
100 grit — for rapid stock removal
120-150 grit — for off-hand sharpening
220-250 grit — for finishing
320-400 grit — for fine finishing
500 and finer — for mirror finishing

Combining concentrations and diamond particle sizes, some wheel manufacturers recommend 100 concentration for wheels under 220 grit; 75 concentration for 220 grit and finer and dry wheels; and 50 for vitrified and metal bonded cup wheels for off-hand grinding, and for finer resinoid bonded cup wheels.

The Industrial Diamond Association recommends medium concentration for most off-hand grinding operations. But, they add, some operations, such as small tool finishing, take higher concentration wheels to avoid over-heating, wheel clogging, and checking. Then, they say, use light pressure and still get rapid stock removal.

Fixed feed grinding usually requires high concentration wheels. Medium concentration is all right with 220 and finer mesh size, however.

Higher concentration is especially important too in production shops,

There May Be Changes . . .

. . . in the diamond wheel identification system. Under consideration by wheel makers is the feasibility of adding standard numbers to the present standard designations, to cover location of diamond section and wheel shape.

where high labor costs demand that the work be done as fast as possible. Use high feed pressure and high diamond concentration in such instances.

For economy, buy the highest concentration suitable for the job. At the same time, don't buy more diamond depth than necessary or that can be used in a reasonable length of time, for as Wickman Manufacturing Co.'s Edward Kiel puts it, depth doesn't affect grinding ability . . . concentration does. As for selection of grit size, always use the coarsest grit size commensurate with the finish required. Larger diamond particles can be retained in the wheel longer, so the wheels last longer; but they are not suited for fine finishes. At the same time, fine grit wheels should not be used for heavy stock removal. Rough grind with coarse grit wheels; finish with fine.

The bond holds the diamond particles in the wheel securely, yet does little or no real cutting. Its role is to keep sharp diamond points in contact with the work by wearing away, as diamond particles become dull, to expose new diamond cutting points. It determines cutting action and wear.

If the bond is soft, for instance, the diamond particles tear out easily, giving free cutting action but wearing faster. If the bond is hard, the diamond particles stay in the wheel longer, the wheel itself wears more slowly, and the cutting action is slower. The optimum relationship between bond, grit size, and concentration would be a bonding material which would wear at the exact same rate at which the diamond particles become dull. That way the dull particles would fall or be torn out of the wheel just as they become dull, and new diamond points would be uncovered just as they are needed.

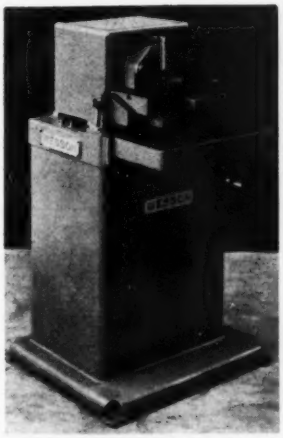
The grade or hardness of the diamond wheel, as with any other abrasive, is the resistance the bond offers against letting the abrasive be torn out of the wheel to expose sharp cutting edges. This too varies among bond types and manufacturers.

QUICK GUIDE TO SPEEDS AND FEEDS
(Standard Wheels)

Wheel Speed*	3000-6000 sfpm**
**Depends on coolant, pressures	
Down Feed	80-100 grit—0.0001"
	150-220 grit—0.0005"
	240 plus grit—0.00025"
Table Speed	100-500 ipm
Cross Speed	0.030"-0.060" per pass

*Recent tests at Carborundum with special metal bonded wheels show that the metal bonded wheel outperformed the resinoid wheel at speeds to 12,000 sfpm. High-velocity grinders run special metal bonded wheels to 18,000 sfpm.

CHART A



Figs. 2 and 3. Hold the carbide tool in fixed position and let the oscillating wheel do the lateral moving. This is how the oscillating grinders, such as these manufactured by Wesson Company and Hammond Machinery Builders, Inc., simplify tool grinding.

HOLD TOOL STILL . . . LET WHEEL OSCILLATE

For some time carbide tool manufacturers have used oscillating grinders to mass-produce their carbide tools. Now oscillating tool grinders built on a tool-at-a-time instead of a "gang" or mass production principle, are available for precision grinding of standard or special single point tools. With them all lateral movement of the tool on the part of the grinder-hand is eliminated. Instead, the tool is held in fixed position and the diamond wheel does the moving across the tool tip. The contact point of the wheel changes constantly and generates a multiple cross-hatch pattern, which is essential for very fine finishes.

The oscillating grinding action maintains a uniform flatness of the wheel face because the entire wheel face reciprocates across the tool tip. This eliminates wheel grooving, and thus eliminates downtime for wheel trueing and dressing, the grinder manufacturers claim. Only slight pressure on the work table is necessary for feeding the tool to the wheel.

The Hammond oscillating grinder can be combined with an electrolytic Power Pack for even faster electrolytic grinding. With both the Hammond and Wesson grinders, the operator can control the oscillation range.

90% Resinoid Used

An estimated 90% of all carbide tool grinding is done with the versatile resinoid bonded diamond wheels. They are soft, and offer smooth, rapid, cool cutting, and retain their keen abrasive action well. But, their softness can easily lead to grooving and scoring and lower efficiency. The IDA says, however, that for wet or dry operations, particularly for fixed-feed grinding, the resinoid wheel will take considerable abuse without harming the tool or workpiece.

Improvements in the resinoid and metal wheels are enabling them to overshadow the vitrified wheel in popularity. Actually vitrified wheels are between resinoid and most metal bonds on the hardness scale. They are free cutting and resist the tendency to groove and score. They offer faster, sharper cutting action than metal bonded wheels because the sharp diamond points of a vitrified wheel protrude more from the wheel's surface. In addition, they do not glaze as readily as metal bonded wheels.

Metal bonded wheels are durable, give long life, and resist grooving and scoring. Grinding time with metal bonds is about three times that with resinoid wheels; moreover, glazing is a problem, and dressing is frequent. Coolant is a must with metal

KEEP CARBIDES SHARP . . .

— GENERAL RECOMMENDATIONS —

	Sharpen . . .	On . . .	for Rough Grind . . .	for Finish Grind . . .
Off-Hand Grinding	Single-Point Tools Fly or Step Cutter Teeth Drill Tips Scraper Blades	Off-hand carbide grinder, using cup wheels. Keep tools moving; use sliding sub-table.	With 14" 60 grit silicon carbide wheel*. With 10" and 14" carbide tool grinders, porous or open structure type wheels have been successful. OPTIONAL: Semi-finish small finishing tools, or finish large roughing tools on 10" 80-100 grit silicon carbide wheels.	With 6" or 10" 120-320 grit diamond wheel (vit. or metal bond) according to finish required.
		Grind chipbreakers (steel cutting tools) on chipbreaker, surface, or universal grinder, using high concentration 100 grit resinoid or 150 grit vitrified straight wheel, depending on thickness of chipbreaker.		
Machine Grinding	Flat or Circular Form Tools Solid Insert Tool Bits C'Less Grinder Blades Surface Broaches	Reciprocating table surface grinder, using straight, flaring cut, or dish wheel, according to operation being performed.	With a 100 grit diamond wheel†.	With a 180-320 grit diamond wheel†, according to the work finish required.
	Solid Precision Boring Tools	A duplicating precision grinder, using straight wheels.	Only where tool has been damaged; with 220 grit diamond wheel†.	With 400 grit diamond wheel†. Usually a solid boring tool, when finally worn to where chatter marks or lower micro-reading appear, is worn sufficiently to require a minor touch-up. This is more a lapping operation.
	Milling Cutters Reamers Thread Chasers Centerbores, Spot Facers Hobs, Saws	On a universal tool and cutter grinder, using a straight, flaring dish, or dish wheel, according to operation being performed.	With 120-180 grit diamond wheel†.	With 180-240 grit diamond wheel, according to work finish required.

AVOID GRINDING steel on silicon carbide or diamond wheel. Use aluminum oxide for grinding steel tool shanks or cutter bodies. Conversely, do not attempt to grind carbide on aluminum oxide wheels, which are not hard enough to cut cemented carbide.

HARDEST GRADES of carbide — ordinarily used for precision finishing—should be rough ground gently to avoid heat rise or sudden temperature change. Finish grind with fixed feed not over 0.0004"/pass. It is better to use diamond wheels only for both rough and finish grinds.

MICRO-FINISHING: Experience in many plants indicates that exceptionally fine finishes on carbide tools improves tool life measurably over ordinary grinding. Usually this means a greater number of perfect pieces ground and often results in few inspection rejects. Super, mirror, or micro-finishes can be applied by lapping or polishing with diamond or boron carbide powder or paste on special lapping discs—usually cast iron or hardwood. Such finishes are seldom mandatory and are often impractical for economic reasons. This can usually be determined by trial in the particular plant concerned.

*"Green" silicon carbide wheel, vitrified bond. Preferably used dry, but with efficient exhaust system for dust removal. When grinding wet, use continuous stream of coolant at point of cutting.

†Soft, resinoid bonded wheels of 100 concentration. Always use vapor, mist, or continuous stream of coolant. Direct coolant against wheel ahead of cutting, rather than tool tip.

Figure 4.

wheels, and oil cooling is not always satisfactory. Because they grind slower, crazing of the ground tools is a problem . . . and crazing causes tool failure.

Metal bonded wheels have hard edges, so suffer least edge wear. But, the tools' edge quality is not as good when metal bonded wheels are used with conventional techniques, and tool life is apt to suffer as a result. Good service life and long service life, coupled with the fact that it is often easier to teach new or relatively unskilled operators the peculiarities of metal bonded wheels, make them quite acceptable and useful in the tool grinding department.

Variations of the metal bonded wheel have been developed for newer grinding techniques, such as high velocity grinding and electrolytic "grinding." These will be discussed later.

Silicon carbide was blown out of proportion as a carbide grinding material in the early 1950s. Now, most diamond wheel manufacturers and diamond wheel users agree, it is used mainly for roughing cuts . . . not for finish work. The application of the finished tool is the deciding factor as to whether silicon carbide can be used, and to what extent.

Diamonds for Smoothness

Diamond grinding in general provides the smoother tool finish and better cutting edge, and will cut the harder grades of carbide with relatively greater ease. The harder grades and very small pieces of carbide are more sensitive to grinding injury. The danger of grinding injury, though, is decidedly lessened by grinding with diamond. Fine details and keen edges also demand the faster and smoother cutting action of diamond wheels, which have the added advantage of retaining fine form details.

In many cases where silicon carbide does or could substitute for diamonds, these possibilities must be considered before making the most economical choice: silicon carbides usually require longer grinding time; result in shortened tool life; necessitate more frequent grinds; result in greater machine tool downtime; and have a higher mortality on cemented carbide tools.

Wheel tests and evaluations help make certain the wheel being used is best for the job. A careful check on wheel wear and carbide removed in grinding a given number of pieces of the same size and type, using two or more wheels, gives the user a reliable guide to wheel selection, says Norton Company.

Wheel choice made, what else can be done to increase the economy of diamond grinding, and to conserve diamonds?

Speed recommendations vary all over the lot, but the principle behind speed and feed control doesn't: You save diamonds and money by running at speeds and feeds which give the best average tool life, wheel life, finish (according to the job's requirements), and cost per grind. Using coolants, the average wheel speeds for carbide tool grinding are between 3,000-6,000 sfpm; with table or work travel between 100-500 ipm. Hold speed below 3,000 sfpm if grinding dry, however, wheel makers caution. Chart A gives more details.

If the grinding machine spindle is not up to speed, wheels rub, fail to cut, and lose their diamonds (and life) too fast. Bad bearings, Ed Kiel adds, are responsible for wheel vibration and runout, resulting in ineffective and sometimes damaging grinding action. Increasing speed too much causes the wheels to act harder and cut more slowly. This overheats the wheel and results in rapid wheel wear, which is costly.

There are two exceptions to the accepted theory that higher speeds cause fast wear. Wheel speed tests conducted by Carborundum's Abrasive Lab show that at 12,000 sfpm, resinoid-like cutting action and metal-bond-like wheel life results. They used a special metal bonded wheel and modified grinder to achieve these results.

The high-velocity grinder manufactured by Ohio Metalworking Products Company is even faster. It operates successfully at speeds up to 18,000 sfpm, using a metal bonded wheel. At such speeds, the wheel creates sufficient heat to instantly plasticize the carbide's bond and permit rapid wear of the carbide, while preventing work hardening and faults in the carbide.

Careful with Feeds

Overfeeding diamond wheels is one of the fastest ways to shorten wheel life, Carborundum's Ripple warns. Reductions of up to 90% in wheel life from overfeeding are common, he reports.

Here is a short comparative test for establishing proper infeeds: Measure and compare wheel losses, using infeeds of 0.0005" and 0.001" on cutter grinding and surface grinding jobs. Repeated tests at Carborundum show that doubling the infeed like this increases wheel loss three and one-half to four times, due to excessive pressures, overheating, and grooving caused by the high infeed. This expense from overfeeding is magnified tremendously in plants using many wheels, and/or the more expensive wheels.

FASTER . . . AND CHEAPER

A sizeable job-shop type plant took a close look at its carbide grinding program a year ago and ended up with a switch to high-velocity (18,000 sfpm) grinding with these results: A substantial increase in the volume of carbide tools ground without adding personnel or equipment; a substantial reduction in both cost and consumption of diamond wheels after changing to the long-life metal bonded wheels used for Hi-V grinding; an increase in tool life because of the high quality finish (2 micro-inches), decrease in carbide stock removal, and elimination of a considerable amount of tool checking and other tool damage; and a reduction in grinding time.

Summarized, their yearly cost comparison was as follows:

YEARLY COST OF GRINDING WHEELS

	Old Method	Hi-Velocity
No. Diamond Wheels Used/Yr @ $363 each	12.5	1.0
No. Diamond Wheels Used/Yr @ $89 each (Hi-V wheels)	——	2.3
No. Silicon Carbide Wheels Used/Yr @ $27.99 each	29.0	29.0
Total Cost/Yr for Carbide Tool Grinding Wheels	$5,359	$1,379

YEARLY COST OF CARBIDE TOOLS

	1955 Volume Old Method	1956 Volume Hi-Velocity
No. Carbide Tools Used	1,117	888
Total Cost of Carbide Tools	$5,174*	$4,164
Lbs Metal Removed with These	9,799,886	10,923,526
Carbide Tool Cost/Lb	$0.00528	$0.00381

*Carbide tool purchases, if serviced by old method, for 1956s raw material volume, would be:
0.00528/lb x 10,923,526 lbs = $5,768.

The excess cost of carbide tools serviced by the old method to handle the 1956 raw material volume would be:
$5,768 − $4,164 = $1,604 savings.

Several factors contributed to the increased tool life (decreased tool cost/lb raw material) so only 30% of the savings, or $481, was accepted by the company in figuring costs.

Considering these and other factors, the company's audit on the project for the purchase of the Hi-V grinder showed these savings:

SAVINGS	AMOUNT	% SAVINGS	EXPENDITURE	% RETURN
Estimated	$3,383	100%	$5,602	60.4%
Actual	$4,389	130%	$5,421	81.0%

Smoothness of feed is important to diamond conservation, too. It prevents gouging and other damage to the wheels themselves, and helps maintain accuracy of tool cutting angles and relief. Grinders being manufactured today feature bearing-guided tables for smoother feeding. A few years ago, Carbide Tool Company and Detroit Milling Cutter Company (now Futurmill, Inc.) brought out sliding sub-tables which could be mounted on grinders not so equipped. In off-hand grinding, using the sliding sub-table, the operator can approach the wheel at any point he chooses, with a smooth, even motion. The entire surface of the wheel is used rather than just the center, as often happened with completely operator fed and controlled off-hand grinding. Over-all savings resulting from such feeding includes wheels, labor, and improved tools.

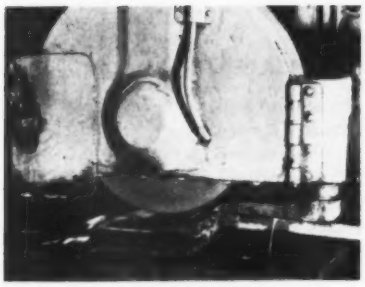


Fig. 5. A heavy flow of coolant is most effective for diamond wheel grinding, but not all machines can handle it and operators usually dislike working in it.

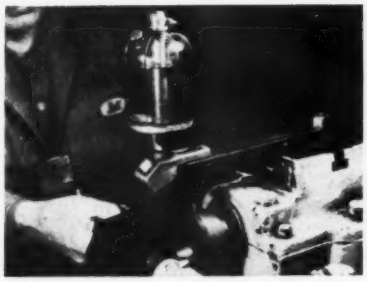


Fig. 6. Wick application of coolant, shown here with guard removed, is said by some to be acceptable for diamond grinding. Others prefer no coolant rather than either wick or drip application.

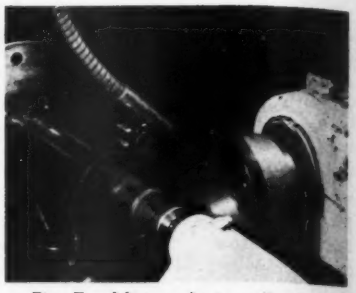


Fig. 7. Mist coolant applications, shown here with guard removed, are becoming more widely used because they are comparatively clean and cool effectively.

Watch for Heat

Heat is Public Enemy No. 1 to diamond wheels. Resinoid bonds are oxidized and burned by excessive heat, causing extra wear and even cracking. The greater the heat the greater the damage, with final results in the form of spalling and stripping of the diamond section.

Metal bonded wheels are not readily oxidizable, but are still subject to damage from overheating. The injury shows up in the form of warping and the ultimate separation of the diamond rim from the wheel backing. Vitrified bonded wheels cannot be oxidized by grinding temperatures. Their visible effects of heating include chipping, cracking, and spalling.

Anything which causes heat — excessive pressures or downfeeds, lack of adequate coolant, insufficiently mixed coolant, excessively high wheel speeds, improper dressing, etc. — causes damage and should be alleviated.

Dry grinding robs resinoid-bonded diamond wheels of approximately half their life. The reason is simple. Under dry grinding conditions it is difficult, if not impossible, to prevent the burning and charring of the wheel bond. When the damaged bond can no longer retain the diamond particles, they are pulled out before they are worn out, and short life results.

The common objection to wet grinding is that some machines are not built for it and lack water guards, drains, and other necessary features. On such machines it is impossible to use a heavy flow of coolant, but a lesser supply will help. Kerosene wicks and various drip and spray devices usually provide sufficient coolant for money-saving diamond wheel usage in these cases. The newer mist systems overcome the old objection that the area around the machine was saturated with spray. With a strong air current, considerable cooling action is accomplished with as little as a pint of coolant per day. There is instantaneous evaporation and no mess in the work area with this small amount.

"With the exception of a machine such as an optical form grinder," Mr. Ripple believes, "there doesn't seem to be any valid reason for dry grinding." If other reasons were lacking, he adds, "the probability of a 50% reduction in wheel usage, which is not uncommon, should be incentive enough."

A few years back, plants were boasting of the wonders of carbon dioxide (CO_2) as a coolant with diamond grinding wheels. The cooling value of the CO_2 hasn't changed, but the economics of the operation has directed users away from it. The National Cash Register Company tested CO_2 and compared it with conventional coolants. Their investigations, reports G. J. Oswald, head of the NCR Metallurgical Research Department, show "excessive cost and no advantage over regular type coolants." A. P. de Sanno and Son Inc. point out that CO_2 coolant is still being used in a few places, but the cost is too great for most. They believe that until the manufacturers of the gas make CO_2 available at less cost, the operation will be too expensive for general use. In times of a national emergency, of course, cost would be no object, so CO_2 would probably be used more widely.

To keep diamond wheels cutting effectively and to guard against heat damage it is necessary to make certain their faces are running true and that they are not clogged with grinding particles. True and dress peripheral type wheels with a soft grade of 80-90 grit silicon carbide; cup and dish type wheels by hand lapping the diamond face on a cast iron lap, using about number 100 mesh silicon carbide with water as a vehicle. Always true diamond wheels wet, the Industrial Diamond Association recommends, and never with a diamond trueing tool.

Vitrified and metal bonded wheels should be dressed regularly with soft silicon carbide, wheel makers say. Pumice stone should be used for dressing resinoid wheels. Here too, coolant is recommended. Rubberized abrasive blocks developed by Cratex Manufacturing Co. can also be used for cleaning and dressing diamond wheels effectively. The rubberized block tends to "flow" around the diamond particles, and minimizes the costly danger of dislodging them.

Because the wheel mounting is so important to accurate grinding, it is wise to remove the whole wheel assembly (including collet) when changing wheels for any reason.

COMPARE THE SUBSTITUTES

	Electrolytic	Electro-Spark	Ultrasonic
Method of Removal	Electrochemical	Spark-arc bombardment	Mechanical impact
Kind of Work Material	Conductive	Conductive	All hard material
Rate of Removal	Fast (0.040 cu in carbide/min)	Slow (0.008 cu in carbide/min)	Slowest
Type of Cuts	Requires rotating wheel	All	All
Thermal Damage	No	Yes	No
Visibility of Work	Open (Wet)	Submerged in oil	Open (Wet)
Type of Coolant	Conductive electrolyte	Insulating oil	Water slurry
Power Supply	D.C. rectifier plus automatic control	A.C. pulses	Ultrasonic generator

Photo courtesy Anocut Engineering Co.

Fig. 8. A single point tool electrolytically ground at Kennametal, Inc.

This way, the wheel will remain in running truth on the collet until worn out, assuming that the machine spindle runs true. Diamond wheels should rotate true within 0.001", so they should be mounted with the aid of a dial indicator.

It is sheer folly to expect the conservation of diamonds to rest with the grinding materials alone. A big conservation area is in the use of the carbide tools themselves; if the carbides are used as efficiently as possible, little sharpening is necessary, and few diamond wheels are needed for the job. Letting carbide tools pass across the line that divides ordinary dullness from actual breakdown is a waste of diamonds, carbide, and money.

It is up to the carbide user to know that pressures and wear increase rapidly as carbides are worked beyond the "dull" point. Adopt a criterion for carbide wear and grinding, and stick to it for most effective and economical results.

In Place of Diamonds . . .

Economical use of diamonds is synonymous with the use of substitutes when they "fit the bill." None of the presently available "substitutes" for diamond grinding wheels — electrolytic, electro-spark, and ultrasonic grinding — is a panacea, but all merit consideration.

Electrolytic grinding is a fast and efficient diamond-assisted method for sharpening single point carbide tools. Pratt & Whitney Aircraft and a number of other users report that an 80-90% reduction in diamond wheel wear is possible with it. It can be used in applications which normally consume over 50% of the available diamond bort, C. R. Stroupe, vice president of Anocut Engineering Company, estimates. These include grinding materials which are as hard or harder than 60 Rockwell C; materials which are sensitive to heat because of possible thermal damage to metallurgical structure or warping; or which are tough and stringy and tend to burr in such a way as to require secondary grinding operations.

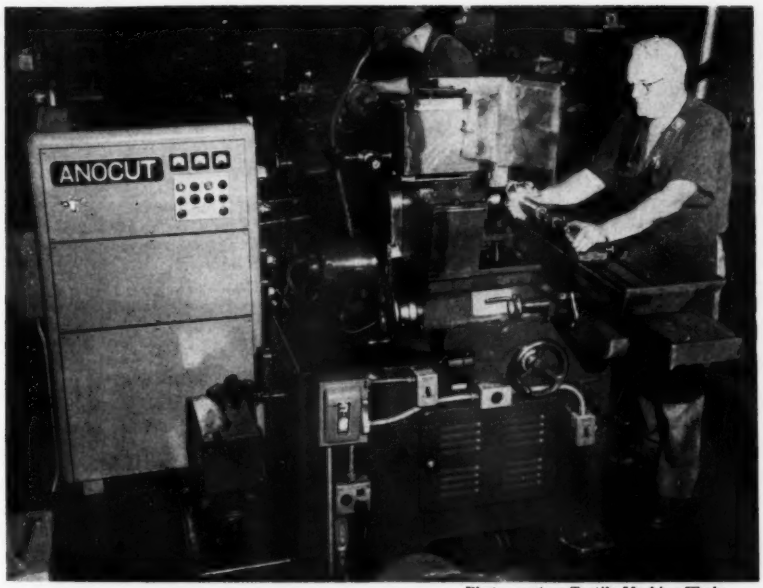


Photo courtesy Textile Machine Works

Fig. 9. Anocut electrolytic supply unit attached to a Cincinnati No. 2 cutter grinder.

Described as a combination of high speed etching and abrasive lapping, electric current is used to disintegrate rather than actually grind the material to be removed. A special metal bonded diamond wheel is used, but it barely touches the workpiece surface. Its job is to clear away the disintegrated material and maintain clearance for the electrically charged coolant between wheel and workpiece. This method is two to four times faster than conventional grinding, depending on the material being ground. Surface finish varies from two to 12 micro-inches, depending also on the workpiece.

Electrolytic grinding gives a matte

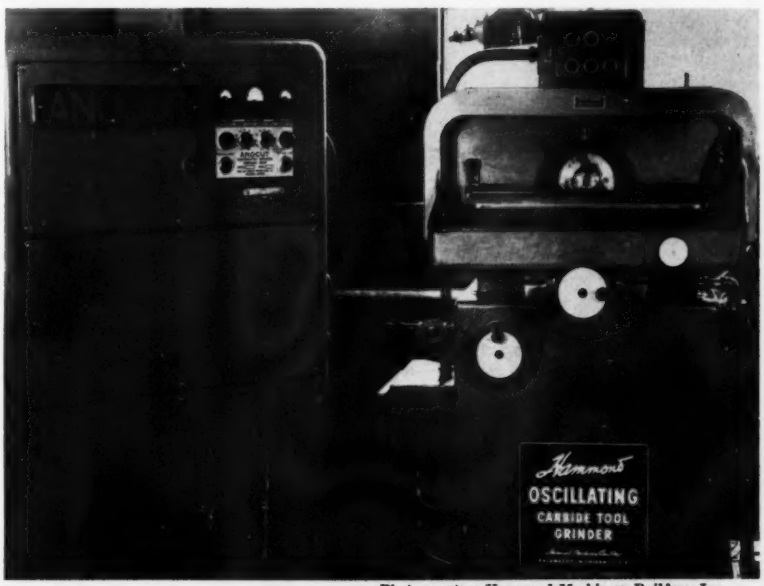


Photo courtesy Hammond Machinery Builders, Inc.

Fig. 10. An electrolytically powered oscillating tool grinder.

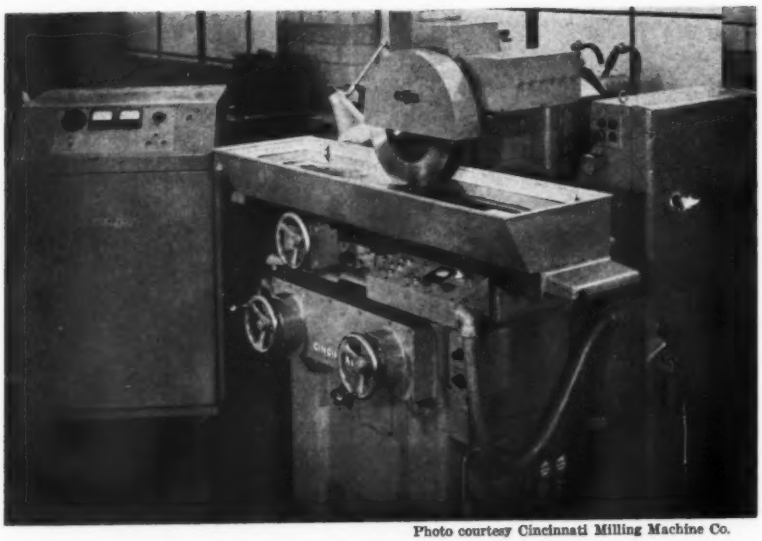


Photo courtesy Cincinnati Milling Machine Co.

Fig. 11. A Cincinnati Elektrojet surface grinder, this one with circular electrode, operates on the electro-spark principle, with power supplied by an Elox unit.

finish to carbides rather than a bright shiny finish. Some tool users hold this against the process even though the matte finish is free from cracks and the ground tools have smooth edges.

A Thompson Products tool grinding department installed an electrolytically equipped Hammond tool grinder last year. With conventional grinding, they used one diamond wheel per month; with the electrolytic grinding, the wheels lasted four to five months. They use an automatic power feed table on the machine to automatically control the amount of material to be removed.

Pratt & Whitney Aircraft's Gallmeyer and Livingston surface grinder is used for chipbreaker grinding. Regular diamond wheels lasted through 2,500 cuts, the electrolytic wheel makes 25,000-30,000 cuts.

To get the most out of the electrolytic grinding equipment, a shop must make certain that it has enough grinding operations to keep the faster machine busy and to justify the higher cost of the equipment. A complete "packaged" electrolytic grinder sells for around $10,000. Many conventional grinders can be converted for electrolytic grinding by the addition of electrolytic supply units, such as those made by Anocut Engineering Co. The price of these ranges from $400 to $1,000.

In electro-spark grinding, no diamonds are used. A positively charged workpiece and negatively charged electrode or shaped tool are energized by a high amperage electrical current in a dielectric fluid. Controlled impulses remove particles of the workpiece when the tool and workpiece are brought in close proximity, to form a reverse image of the tool in the workpiece. This cycle is repeated many times a second, and the resulting surface on the workpiece has a uniform matte finish. The removed particles are washed from the surface of the workpiece by the circulating dielectric fluid.

A Michigan manufacturer of electro-spark equipment reports this method is 50-75% faster than conventional tool grinding on flat surfaces, and it saves 50-75% of tool cost. It is somewhat slower than electrolytic grinding, but can produce more intricate shapes than electrolytic grinding.

Specific applications help decide the choice between electro-spark and electrolytic grinding.

Ultrasonic grinding is an abrading process: Tool strokes a few thousandths of an inch, oscillating lineally approximately 20,000 cps, bombards the workpiece and drives the abrasive grains against it. The workpiece is held below the tool, and a slurry of boron carbide, silicon carbide, or other abrasive (no diamonds, however) introduced between the tool and the workpiece. The rapid vibrations eat away the workpiece, duplicating the form of the tool. In the realm of carbide tool grinding, so far it has had only limited application to chipbreakers.

The hardness, brittleness, and density of the material being ground governs ultrasonic abrasive choice and the rate of stock removal. The more brittle the material, the coarser the abrasive used, and the faster the stock removal.

Finish and accuracy depend on size and finish of the tools, the fineness of the abrasives, and the material being ground. For roughing, Sheffield engineers report a 25 micro-inch finish available with 280 grit abrasive. For maximum precision and smoothness with ultrasonic grinding, Sheffield engineers recommend more than one tool and grit size be used.

Machining capacity, The Sheffield Corporation tells us, is limited by the power capacity of the transducer that operates the machine. This varies from 3½" to 0.006" dia cavities. With ultrasonics too, the job to be done determines the choice of using the method and the equipment needed.

Your 'Mine' . . . the Salvage Bin

Three-and-a-half million dollars worth of diamonds were recovered from diamond swarf and sludge and broken wheels by value-conscious diamond users in 1956. Judging from the increased use of diamonds, last year's salvage figures should be considerably higher.

Salvage programs can net as much as 30% to 50% of diamond wheel costs. Most reclaimers, however, estimate that a good salvage program yields an average savings of 10% of diamond wheel cost.

Rule-of-thumb salvage rates for various types of wheels are 4-5 carats/lb of swarf or sludge from resinoid wheels; 4 carats/lb from vitrified wheels; and ½ carat/lb from metal bonded wheels. One reclaimer generalizes more by stating that most diamond swarf from carbide grinding operations contains 1-5 carats of diamond/lb of swarf. He admits, however, that if resinoid wheels are used exclusively, the concentration usually runs higher. This, of course, is because the soft resinoid bond wears away faster to expose diamond cutting points faster. Individual plant and/or operation dif-

Easy Dry Salvage

Connect a disposable paper vacuum cleaner bag to the exhaust system connected to the grinding machine using diamond wheels and no coolant. When the bag is full, send it to the reclaimer, and attach another bag.

Fig. 12. Small, self-contained Torit diamond dust collector, which operates on a special separating principle, yields a 30% return for an automaker's program salvage.

ferences will make reclamation figures vary, as will differences in reclaiming methods.

The best way to reap maximum carats and dollars from diamond salvage is to establish a definite full-time salvage program. First thing to do is appoint a salvage coordinator — a responsible person with authority from management to plan and install collecting setups; to indoctrinate machine operators, toolcrib attendants, and everyone else who might add to the salvage "take"; and to keep the salvage program rolling. The program itself should take into consideration these dozen-plus hints gathered from reclaimers and wheel users alike:

- Collect diamond wheel stubs as well as grinding sludge and swarf, although the bulk of reclaimed diamonds will come from the sludge and swarf.
- Collect lapping cotton and rags, wire drawing dies and dull or broken shaped diamond tools, if these are available from operations in your plant.
- Separate wheel stubs from swarf and sludge, as they are reclaimed by different methods.
- Keep diamond wheel sludge and swarf separate from non-diamond abrasive dust. Once the two are mixed, it is difficult to separate the diamonds, and the recovery rate is rarely satisfactory.
- To collect diamond-bearing sludge from wet grinder operations, clean out the coolant tank, allow the swarf to settle, and draw off the water. Ship the semi-dry sludge in waterproof containers to the reclaimer. Use a coolant tank for diamonds exclusively. The additional recovery of diamonds from the segregated sludge can soon pay for the tank.
- In dry or drip-wet systems, central dust collecting systems are often ineffective (for diamond recovery) because diamond dust becomes highly contaminated with non-diamond abrasives. Some shops do have effective special traps built into their central dust collecting systems, however. A baffle in each trap may be thrown one way during diamond grinding, and the other way during ordinary grinding operations.
- Dust collectors are on the market for collecting diamond dust at the grinding machine. Torit Manufacturing Company's small, self-contained model is a good example of this type unit. One large automotive plant reports saving more than 30% of the carats originally contained in the grinding wheels since installing the small diamond dust collectors at each grinder. The units cost less than one diamond wheel used in the plant, and operate on a special separating principle that eliminates filters.
- Diamond swarf should contain two carats/lb to make salvage worthwhile, some reclaimers suggest.

Fig. 13. Diamond swarf and sludge can be shipped to reclaimers in a variety of containers.

- Send representative samples of swarf or sludge to various reclaimers to compare reclaiming results and check diamond content.
- Salvage is most profitable when 100 carats or more are contained in each lot of swarf or sludge. Some reclaimers pay a bonus rate for such large amounts.
- Although reclaimers prefer working with larger amounts of swarf, smaller accumulations are perfectly acceptable and normal, especially from smaller toolroom salvage programs.
- Three to six months' accumulation of worn-out wheels and swarf usually makes what reclaimers call a "workable lot."
- Vent moist sludge drums if fermentation from grinding compound residues is likely.
- Build up salvage enthusiasm among employees. Keep telling them the dollar-and-cents value of salvage and reclamation programs.

Compare reclaiming results . . .

. . . by sending sample batches of sludge or swarf to different reclaimers. For a true picture of the results from the different reclaiming methods, it is important to

- **Send sludge or swarf from the same type, size, and brand wheels and from the same type operation to each reclaimer.**
- **Send like amounts of sludge or swarf.**
- **Then, compare carat return from the different techniques, and choose your reclaimer accordingly.**

Diamonds . . . for Trueing and Dressing

Diamond wheels are neither trued nor dressed with diamond tools. But, for fast trueing and dressing, precise wheel concentricity and parallelism, and clean wheel faces, conventional abrasive wheels are best treated with diamond tools.

Since 1956 there have been two major types of diamond trueing and dressing tools available: One utilizes a single large diamond or a cluster of large stones, set in a holder; the other, many small diamond particles, uniformly embedded in a binder. With either, abuse of the tools themselves is the bigest diamond- and money-wasting factor.

The illustrations on next page show a properly used single-diamond tool, and results of improper use. Compare them with the condition of your trueing and dressing tools to ascertain if and how such tools are abused in your plant.

Koebel Diamond Tool Company's cemented diamond particle, or CDP, tools (Fig. 21) and form cutters are made of the more plentiful small

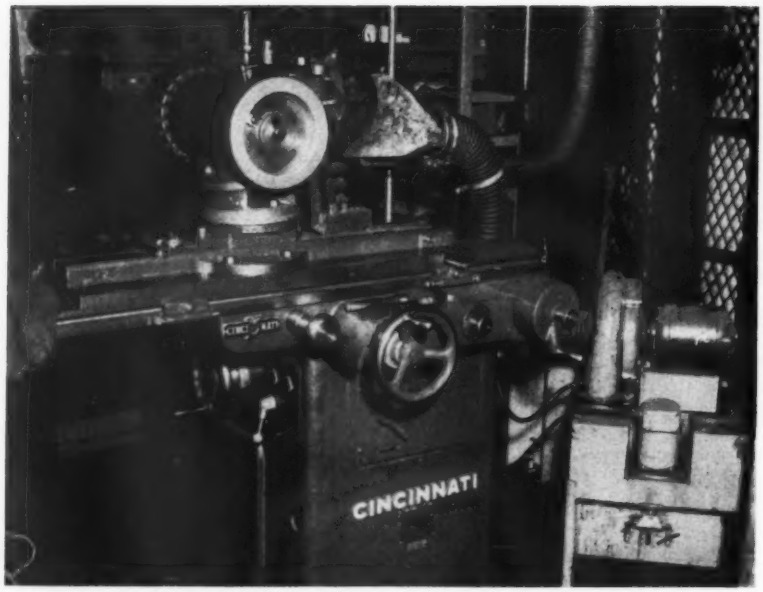


Fig. 14. Coolant application and diamond reclamation are the duo features of Shelboerg Mfg. Co.'s Vap-Air exhaust unit. It can be used with all standard universal tool and cutter grinders, especially dry-type grinders for which it supplies the coolant system. Use of coolant eliminates heat checks in the tools being ground, and the exhaust system collects diamond wheel swarf for salvaging.

diamond particles, like those used in diamond wheels. They are cemented together to form a homogeneous mixture and, reports President Charles J. Koebel, each of the many particles "shares the load" in use. The strength of the tools does not depend on the strength of any one diamond, so the tools' characteristics are uniform and predictable. This was important to the Koebel-Jones & Lamson "perpetual form control" development introduced last year, whereby formed wheels on an automatic form grinder are continuously dressed during the grinding cycle. CDP tools are not re-setable. When the diamond points become dull, they are worn off, much like diamonds in wheels.

Numerous types of special trueing and dressing tools are also available. For instance, Tandemite's new tool (Fig. 22) offers a pair of dressing devices in tandem. The two dissimilar points of contact are said to reduce the amount of pressure, heat, and friction on the diamonds and give longer tool and wheel life.

Final choice of trueing and dressing tools depends on many things — the grinding wheel, its use, the grinding machine, the operator, and so forth. It should be made in consultation with a diamond engineer or supplier.

These suggestions, however, can lead to diamond- and money-saving possibilities when trueing and dressing tools are used:

- Use the right diamond tool for the specific dressing and trueing operation.
- Mount tool tightly and solidly in the toolholder.
- Warm up the wheel-spindle bearings before starting to dress, so conditions are similar to grinding conditions.
- Guard against tool and machine vibrations which cause chatter marks, gouging, and breakage.
- Handle diamond tools carefully. They are easily damaged when subjected to a sudden shock or blow.
- Adjust the tool so the diamond touches as nearly as possible to the "work-wheel" contact point.
- Take light cuts — not over 0.001" for finishing.
- Dress as nearly as possible to the wheel's grinding position.
- Use correct drag angle — 10°-15° for a single point tool on external grinding wheel.
- Approach the face from the highest point of the wheel (usually the center).
- Use plenty of coolant when dressing wheels used wet, and start the coolant flow before the tool contacts the wheel. Wheels used dry should be dressed dry. This is a slower operation because of the danger of overheating the diamond.
- Use wheel speeds as near the grinding wheel operating speed as possible, never higher, except when trueing the regulating wheel of a centerless grinder. This should be done at the highest speed available.
- Turn the diamond tool frequently for even, economical wear.
- Keep the cross-travel even and steady across the face of the wheel.
- Finish the edges of the wheel with a diamond or abrasive stick, unless the wheel is to be used in grinding a square shouldered cut.
- Scrub the wheel with water and a coarse brush after dressing to remove fragments.
- Check wheel and spindles to make sure they are running in balance.
- Dress wheels at regular intervals. Keep records to show the pieces ground/dressing to ascertain best dressing times. Dress before the maximum number of pieces is handled, for economy's sake.

Fine Grit . . . Fine Finish

Fine grit (usually 220-320) diamond wheels give finer finishes to carbides. This was taken at more-than-face value at Black & Decker Manufacturing Co.'s Hampstead, Md., plant, with these favorable results: Lab tests on single point tools finish ground with a 1500 S grit wheel showed they lasted 4, 5, and in some cases, 10 times as long as tools sharpened by previously used methods. Five to 7 micro-inch finish was obtained with the fine grit wheels; previously, a 15 micro-inch was obtained. The fact that the tools are used to machine die cast aluminum accounts for some, not all, of the improved tool life.

What About 'Man-Mades'?

The fact that General Electric Co. is successfully producing man-made diamonds in its pilot plant in Detroit does not mean that the need to conserve diamonds has lessened. The man-made diamonds, slightly more expensive than natural diamonds, will augment the present and future supply of natural diamonds. They will help make it possible to extend the uses of diamonds to

Fig. 21. Diamond particles, cemented together, form the business end of Koebel CDP tools.

ceramics, high temperature alloys, and other yet unforeseen manufacturing and grinding tasks. Then too, in case world situations cause the supply of natural diamonds to be cut off, man-mades will help fill the gap.

What are they like? So far, man-made diamonds are available in very fine grit sizes only. So fine, in fact, that the largest is about the size of a coarse grain of sand. Uses include grinding wheels, lapping compounds, and trueing tools which utilize small diamond particles.

The Human Side

People can make or break a diamond conservation program, just as they can make or break the company's bowling league. It takes a continuing campaign — brain-washing, if you will — to make and keep the shop people, the real diamond and carbide users, conservation and economy conscious. Training them to use their machines and tools is just one part of the answer. The other involves the use of strictly human-to-human techniques.

Impress upon the tool grinders, for example, the actual dollar-and cents value of the diamond wheels they are using. Show the carbide tool user how much more it costs if a tool is run beyond the simple regrind point and a major grinding job is necessary rather than a touch-up grind. Let the abrasive wheel user see how much damage, dollar-wise, results from not turning a trueing tool . . . from plunging a hot diamond into coolant.

Cater to the worker's sense of ownership, Ripple suggests, by assigning a specific diamond wheel to each tool grinder. This means an in-

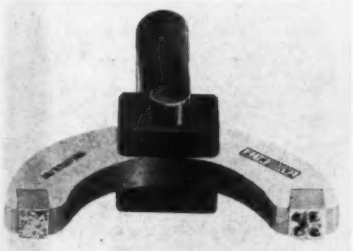


Fig. 22. Two different diamond dressing surfaces, held in tandem in Tandemite's new style dressing tool.

ABUSE . . . NOT USE . . . WEARS DIAMONDS MOST

Compare these trueing tools with those you are using. It may help you spot costly abusive errors being made — at your expense — in your plant.

Fig. 15. A new octahedron diamond mounted in a steel shank and ready for abrasive wheel trueing and dressing operations.

Fig. 16. A properly turned diamond tool has uniform sharp cutting ribs, developed during use by turning the tool frequently. The diamond can be reset and used for many more operations because it is in good condition.

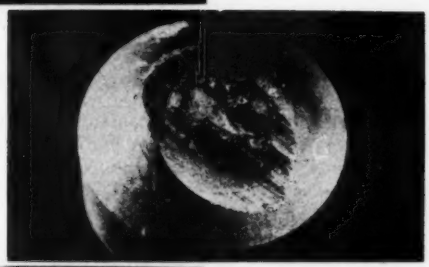


Fig. 17. Using a diamond trueing tool straight into the wheel, without drag angle, fractures the diamond. A 10°-15 drag angle is recommended.

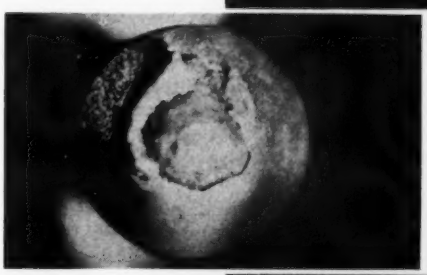


Fig. 18. Side-swiping — starting the diamond into the edge of the grinding wheel each time the diamond is turned — is another major abuse. Correct dressing should have started at the high point on the face of the wheel to eliminate the occasion for side-swiping.

Fig. 19. This abused tool was left in one position too long, resulting in diamond-fracturing heat.

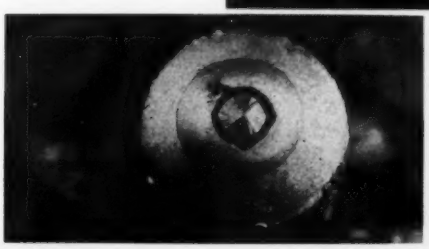
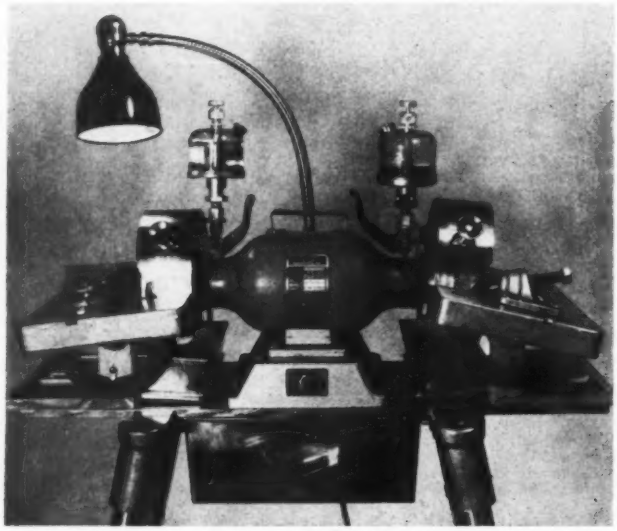


Fig. 20. Heat caused the metal holding the diamond to melt. Such excessive heat probably has affected the hardness of the entire diamond.



Through-wheel cooling and re-loadable diamond wheel, plus roughing wheel are features of the Coolie-Grinder-Lap.

COOL . . . AND RE-LOADABLE

Keep the carbide tool cool and yet avoid having coolant sloshing over it during the grinding operation . . . . That's the problem solved with Diamond Tool Company's through-wheel coolant system, built into its Coolie Grinder-Lap grinding machine.

On one spindle is a 6" 60-grit vitrified ceramic wheel; on the other, a permanently-mounted, cast-iron, re-loadable lapping wheel. Both feature the though-wheel cooling. Coolant is gravity fed from a six oz sight feed oiler to a specially grooved wheel back. Centrifugal force pushes it through the wheel to its surface, and rapid evaporation does the actual cooling. A flood of coolant can be emitted, if desired, however. Tests show that the through-wheel coolant applicator can lower grinding temperatures by as much as 20°.

One of the units was set up at the past Metal Show and was used to sharpen carbide and ceramic tools for other exhibitors. The diamond loaded lapping wheel was kept ready for use by an occasional 10% diamond paste charge set into the wheel with a Roll-A-Set tool, which pushes new diamonds from the paste into the wheel and re-sets dulled diamonds in the wheel. Four diamond wheels loaded with four varied grit sizes were in constant use at the Show, and the total diamond consumption in paste was less than four carats, Sheldon Booth, president of Diamond Tool Company, reports.

The paste is a combination of fine and coarse grits of diamond and other abrasive. The coarser not-so-hard grains assist in resetting the diamonds in the wheel surface, says Booth.

It takes up to 12 lbs pressure to set the diamonds into the wheel; only one to four lbs to sharpen even a ¾" tool. The process gives complete usage of 5-6 points of each diamond, and a 250-325 grit diamond gives fast action and good average finish. Each re-loading, re-setting operation acts to true the wheel, and the machines, says Booth, hold a parallel indication of less than 0.0003".

creased initial expense, but Carborundum records show that the sense of ownership and care usually results in a considerable drop in total wheel expense. Instill in the shop men the interest in spotting wear or trouble spots before they become serious problems.

Call on suppliers to present instruction programs or "refresher" courses on tool and wheel use. A surprising amount of enthusiasm can be generated by such presentations or by distribution of supplier-prepared bulletins. Koebel Diamond Tool Company's booklet on wheel dressing and trueing, "For Men Only," is just one example of good supplier-inspired material especially prepared for the shop people. Wheel Trueing Tool Company's color-slide lecture on the same subject is another.

On the negative side of the situation, don't let untrained employees dress or use diamond wheels. Make certain they are thoroughly trained before setting them loose. Hand pick your carbide tool grinders, by the same token, because seldom do good production grinders become good tool grinders. Look for the steady, easy-does-it type worker when picking carbide tool grinders, not hurry-up production hands. It'll pay in the long run. end

Our Thanks . . .

to these companies for supplying us with information for this feature:

A. I. T. Diamond Tool Co.
Anocut Engineering Company
Anton Smit & Co., Inc.
A. P. deSanno & Son Inc.
Bay State Abrasive Company
Behr-Manning Co.
Buick Motor Division, GMC
Carborundum Company
Cincinnati Milling Machine Co.
Cratex Manufacturing Co.
Diamond Dust Company, Inc.
Diamond Tool Company
Elgin National Watch Company, Abrasives Division
Engis Equipment Co., Hyprex Division
Elox Corporation of Michigan
General Electric Company, Metallurgical Products Department
Hammond Machinery Builders, Inc.
Industrial Diamond Association of America, Inc.
Koebel Diamond Tool Company
Mineral Research Laboratory
Norton Company
Ohio Metalworking Products Co.
Pure Carbonic Company, Division of Air Reduction Co., Inc.
Sheffield Corporation
Shelboerg Mfg. Co.
Starlite Industries, Inc.
Timken Roller Bearing Co.
Torit Manufacturing Company
U. S. Department of Commerce
Wheel Trueing Tool Company
Wickman Manufacturing Company

More Savings from

THROWAWAY TOOLING

through Insert Control

by Charles Brigner
Assistant Chief Engineer
THE VALERON CORPORATION
Detroit 37, Michigan

FEW TOOLING TECHNIQUES have brought as many savings to the American industrial scene as throwaway carbide tooling has in the past few years. Yet, those of us who are engaged day by day in the application of this new type of tooling realize, perhaps more than many tool users, that throwaway tooling is still in its infancy and some of the greatest savings that can be made with it are still to come.

Our Valenite Metals Division has operated a complete throwaway tool engineering department for some time, complete with its own designers, detailers, and checkers. These men devote their attention exclusively to throwaway tooling.

It has been forcibly brought to the attention of this group that many of the possible economics inherent in throwaway tooling are being neglected. They find that many plants are realizing only a portion of the savings possible with the throwaway tools that are already at work in their plants. One of the chief reasons for these losses in the too-common inaccuracy of inserts.

While various groups and organizations have attempted to establish standards for insert quality, a number of loopholes still exist. These standards need further development to guarantee desired accuracy.

The men who devote the major part of their tool engineering activities to throwaway tooling experience a growing conviction that the *precision* insert of today will be the utility insert of tomorrow. And tomorrow's precision insert will be truly worthy of its name.

Throwaway tooling offers a great potential savings (aside from the elimination of tool grinding) by fast indexing of the insert to replace a cutting edge and get the machine under way again in the shortest time possible. But, with today's production demanding closer tolerances, even in turning operations, it is too frequently necessary to reset a tool or take trial cuts after every index. This, of course, costs money and can be avoided with a truly accurate insert and holder.

Today's tendency seems to be to buy throwaway inserts in packages and simply stock them on shelves ready for use. Important savings can be made if the tool user will check all inserts . . . even those labelled "precision." Remember that an error on an insert is doubled on the part manufactured. And certain types

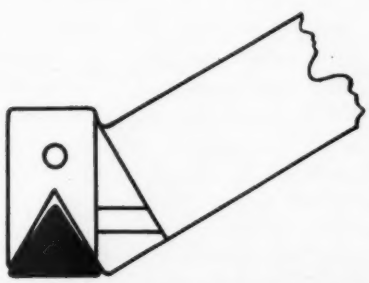


Fig. 1. An angular error on a throwaway insert may adversely affect its positioning in the holder pocket. If one corner is larger or smaller than the specified angle, the carbide will have inadequate back-up.

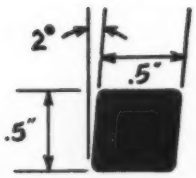


Fig. 2. A square insert that is actually a parallelogram will not index properly.

of insert errors may actually cause damage to holders.

For an example of this, see Figure 1. The sketch shows a triangular insert with one angle greater than the specified 60°. The strain of heavy cuts may fracture this insert or force it back into the holder pocket and cause coining or peening, thereby limiting the usefulness of the holder on further applications.

Of equal importance are the angular tolerances of the holder's pocket. The initial accuracy on the pocket should be such as to give the insert maximum support and identical positioning after each index. Valenite's field staff has inspected a number of such holders in the field. They found that, although accurately made, these holders could not be depended upon for repetitive accuracy after being run for any length of time with inserts having angular errors. Also, because the insert cannot be set into the holder accurately, the location of the cutting edge with respect to the part will be different each time the insert is indexed.

A check of inserts to an accurate template on a comparator is quite rapid and this type of error is easily detected. Inserts having angular errors should be returned to the manufacturer.

Figure 2 shows another very common type of insert error. This "square" insert is actually a parallelogram. A micrometer check would pass this insert as being within tolerance, yet it never could be indexed properly and repetitive use may damage expensive holders. It can be seen that a micrometer check is insufficient.

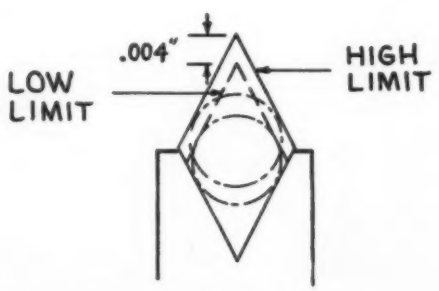


Fig. 3. A slight inscribed circle difference between successively-used diamond inserts will be multiplied in the dimension cut, unless tool is reset.

The drawing in Figure 3 is exaggerated to show the error in the inscribed circle on a diamond tracer insert. As the radius of the circle is reduced, the insert drops back into the pocket. Any inscribed circle error is then quadrupled in the insert. Since the standard tolerance on a diamond insert diameter is ±0.001", an equivalent error will mean that the range of diametrical dimensions resulting on the part between the high and low limits of successive inserts will be 0.008", considerably higher than that normally acceptable on a turning operation.

Inscribed circle tolerance should be watched very closely on diamond and triangular inserts particularly where the angle of the pocket is perpendicular to the axis of the part being turned. Valenite, for example, now is producing diamond inserts with a total tolerance of 0.0002" for use on crankshaft cheeking operations where the manufacturer wishes to avoid excessive grinding. Surprisingly, the cost of these inserts is only slightly above that of conventional precision inserts.

In this cheeking operation, the insert holders have jig-ground pockets for extreme accuracy. It is more than probable that the throwaway holder of the future will be more accurately made to match the increasing precision of available inserts. At present, most buyers of throwaway holders do not expect to pay the cost of jig-ground pockets. Yet the extra cost is very small when weighed against the saving made in tool resetting after every index or insert replacement on precision operations. Also, the holder will last considerably longer.

Figure 4 illustrates the two common errors in radius tangency. While this may not appear to be important at first glance, this type of error has an adverse effect on part finish, part tolerance, and insert life. Life between insert indexes is an important element in manufacturing cost.

Whether to order utility or precision inserts for a specific operation is a question frequently raised. Most plants use rule-of-thumb methods. The utility insert is specified where broad tolerances are allowed on the part, and a precision insert for close tolerances. Valenite's group believes that, if cost studies were made, many operations presently performed by utility inserts would be changed to precision inserts. It should be remembered, too, that precision inserts will usually deliver a slightly longer life between indexes because the finely ground finish helps give smoother, freer cutting.

Utility inserts will always have their place, particularly in roughing operations. However,

a program set up in the carbide user's own plant for grading inserts into size-tolerance groups will frequently pay dividends by permitting these lower-cost inserts to be used on more precise jobs. For any nominal size, for example, segregating all inserts that approach the high tolerance limit in size and using them interchangeably will give far better results than using first one at the high tolerance limit and then one at the low limit. Each application should be treated individually with due consideration to all the cost factors involved.

One cost factor, often overlooked, is the operations that follow the turning operation. Where subsequent grinding time and wheel wear can be saved by turning to closer tolerances, for example, this is an important consideration in insert choice. The right combination of feed, speed, and insert corner radius will give a smooth finish, easy to clean up in grinding.

Many tool users today, it appears, do not expect accurate work with throwaway tooling. Throwaway tooling, however, has already progressed to the point that it can deliver tolerances as tight, and equivalent or better finishes than those gained by brazed or solid tools.

In summary, here are a few specific suggestions offered for getting more mileage from your throwaway tooling dollar:

1. Make sure that holders are accurate. Remember that it is always false economy to buy a cheap, inaccurate holder.

Fig. 4. Error in radius tangency will give unsatisfactory part finish, work dimension, and tool life.

2. Where you have close tolerance operations in your plant, consider selecting or grading inserts for these operations. If the insert can be indexed or replaced without tool adjustment, the cost of grading will usually be minute compared to the savings.
3. Make at least a spot check of all the tolerance elements of the inserts you buy. Insist on receiving the accuracy you pay for in precision inserts.
4. When you check inserts, do not depend on a micrometer alone. Factors not revealed by micrometer checks are considerably more important than dimensional accuracy.
5. Institute a program of inspection for throwaway inserts. You will find that the cost of such a program will be covered many times by increased production. A simple fixture for the comparator and a set of templates will make the checking operation fast and inexpensive. At least one carbide producer is making a kit for this purpose.
6. Educate workers so they will treat throwaway inserts and holders as precision tools. Handle your holders with care and they will help you to derive all the savings inherent in throwaway tooling.

end

PERSONS WITH GLASSES AT HIP AREN'T HEP

THE FRONTAL DROOP: For some reason, people who wear safety goggles around their necks always let the goggles hang down in front. Why not in back? They would be just as useless that way! Or are they trying to hide a double chin, or protect the Adam's apple, or cover up a soup stain?

THE REAR GUARD: This is really a hopeless case. Apparently, those who wear safety goggles in their hip pockets don't know their eyes from the seat of their pants. And what are they trying to protect?

THE NEW LOOK: Some people wear safety goggles on their foreheads. Perhaps they think it looks smart or maybe "air-borne"; or are they trying to get a new look that sets them apart from their fellow workers? If so, they're likely to succeed . . . and get a permanent new look — a patch over one eye, or even two!

THE MISER: Some people seem to value their goggles more than their eyes. They carefully tuck their goggles away in a box or leave them on the work bench. In short, they hoard their goggles . . . at the expense of their eyes!

THE SEALED BEAM: People who wear goggles this way know what they're doing, can see what they're doing and will continue to do so. This type gets its name because the goggles are like sealed-beam car headlights, giving full protection against hazards so that the eyes can continue to shine. *A word to the wise: Protect your eyes.*

Stolen, but with thanks, from Pratt & Whitney's employees publication, "The News".—**EWP**

Angular Grinding on Horizontal-Spindle Surface Grinders

Close-up of stationary fixture and work arrangement used on surface grinder for finishing internal dovetailed ways.

VARIOUS MEANS have been developed through the years to accomplish different kinds of angular grinding on a horizontal-spindle surface grinder.

Magnetic vee-blocks have been often used atop the flat magnetic chuck with which many reciprocating table-type grinders are fitted. Such vee-blocks usually perform the standard function of holding work at an angle of 45° with the surface of the chuck. In some instances however, where it is desired to grind angles other than those at 45° more or less repetitively, special magnetic vee-blocks which hold workpieces at other angles have been employed.

The swiveling type of magnetic chuck is always available for use in connection with angular grinding. In shops where practically every angular job coming to the machine is non-repetitive, use of such a chuck is particularly convenient, due to the ease with which it may be set at any desired angle. Within limits, too, angular surfaces can sometimes be ground while work lays flat on the magnetic chuck, by the simple expedient of using a wheel with the proper angle dressed on the side.

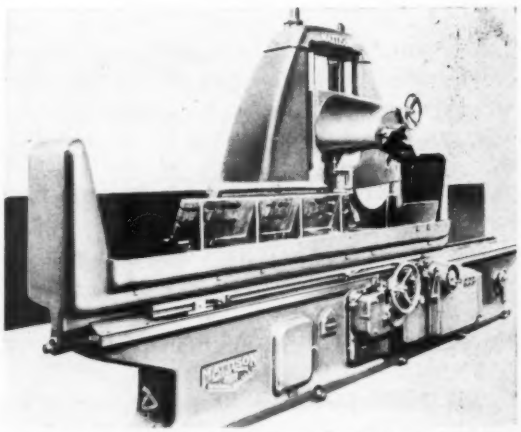
It is possible to apply trunnioned fixtures to the magnetic chuck on such a grinder. Or, a trunnioned fixture may be mounted directly to a tee-slotted table. Some jobs have been observed where an operator goes even farther, grinding several angular surfaces on a part while it is held between centers, and provided with a suitable indexing head. The indexing head employed in any such case can be designed to provide for grinding surfaces located specific required angular amounts apart, of such angles.

There are various instances where it is expedient to fixture a horizontal-spindle, reciprocating-table surface grinder for productive work so that repetitive angular grinding can readily be accomplished to advantage. In conjunction with use of a stationary fixture, one may dress specific angles on the sides of a wheel, if expedient, to obtain the desired results.

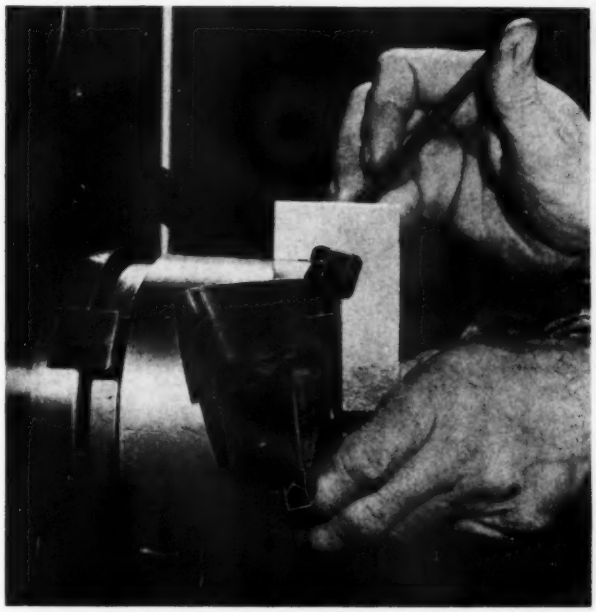
One interesting example is illustrated here — a Mattison grinder, that has been fixtured in the plant of Kent-Owens Machine Company for grinding female dovetail ways of a milling machine table to high accuracy and very fine finish. In this particular case, an angle-trueing device is used, which allows two angles to be trued on the wheel.

Before this method was adapted for finishing these ways, 2½ hrs were required for scraping. Now, the dovetail ways, plus the top and bottom of the table, are ground in 45 min. The dovetail ways are held within 0.0003″ of parallelism. It is a much simpler matter, obviously, to employ similar stationary fixturing on machine tables, together with straight-faced wheels, for generation of required external angles.

end



General view of Mattison horizontal-spindle production grinder, provided with a stationary fixture in the plant of Kent-Owens Machine Company, which enables internal dovetail ways to be ground to fine finish and close tolerances relative to parallelism.



Good tool geometry — positive true rake for free cutting, and negative axial rake for minimum shock — combine with limited number of teeth for adequate chip load to keep horsepower requirements at a minimum while obtaining good wear life.

CARBIDE MILLING OF STEEL ON LOW-HORSEPOWER MACHINES

by Raymond E. Novkov
President
and William B. Stein
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Akron 19, Ohio

SUCCESSFUL MILLING OF STEEL with carbide cutters depends on maintaining a minimum chip load on each tooth. The conventional carbide milling cutter, with a relatively large number of teeth for its size, requires a high feed-per-revolution to provide this chip load. This in turn leads to a high rate of metal removal and thus requires power that many milling machines now in industrial use cannot supply. Low-horsepower carbide face milling can now be done on steel with commercially available cutters. Such cutters feature inserted bits, free cutting action, few teeth for the diameter, shock-free cutting, deep carbide support, easy sharpening, and economical carbide inserts.

Figure 1 shows the variation of milling horsepower with increasing chip load. For all the materials charted, the power required to remove one cubic inch per minute decreases as the feed per tooth increases, and approaches its minimum value at about 0.004″ per tooth feed for sharp cutters and about 0.006″ per tooth feed for dull cutters. Where there is only limited power available, the chip load must be kept fairly high so as to avoid *power waste*. Since power consumption is also appreciably higher for dull tools than for sharp

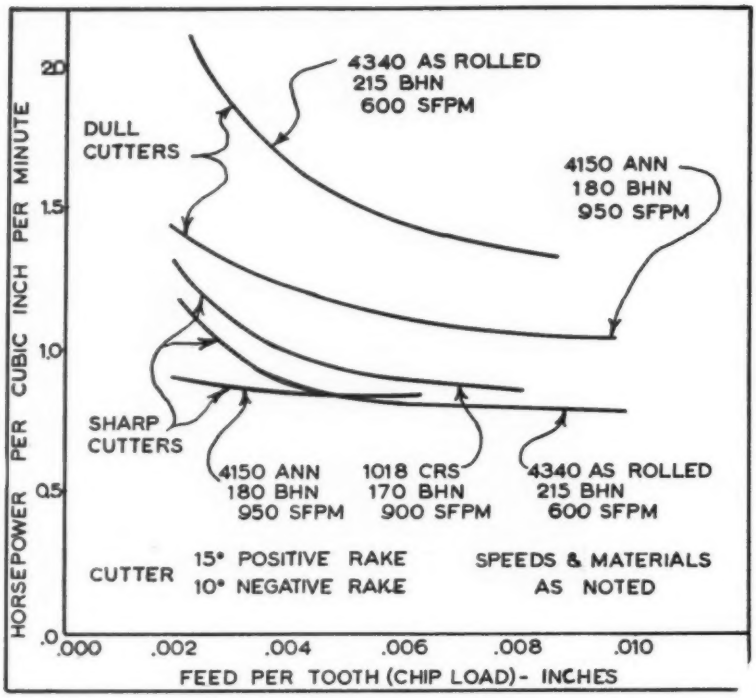
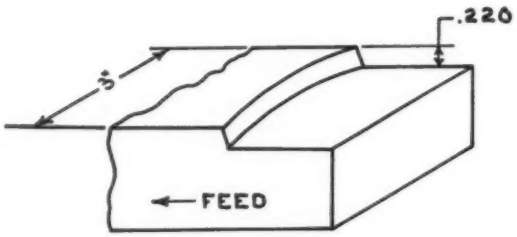


Fig. 1. This chart illustrates the relative horsepower requirements for various chip loads, showing results for three different steels and both sharp and dull cutters.

ones, it should be practicable to remove the cutter inserts for sharpening without removing the cutter body from the machine. This would encourage use of only sharp tools without incurring excessive machine downtime. For economical use, the milling cutter for low horsepower application must, therefore, be especially designed for this type of cutting.

Correct selection of tool angles will improve tool life and increase metal removal without requiring more power. An essential feature for efficient milling cutters is a positive true rake angle (in the direction of chip flow); positive rake tools do less work in foot-pounds per cubic inch removed. The gains in power economy are considerable; in progressing from 10° negative to 15° positive rake angle, a power reduction up to 40% may be expected. Today's uniform high-strength, shock-resistant carbides make possible the use of such angles in milling tools.

Figure 2 shows the feeds per tooth that would result from the use of three different cutters on the operation shown in the sketch. The feeds per tooth are for speeds of 700 and 900 sfpm, an 80% efficient 5-hp milling machine, and specific horsepower value of 1.0 hp/cu in/min. The two- and three-tooth cut-



Cutting Conditions

5-hp Milling Machine, 80% Efficient
Mat'l draws 1.0 hp/cu in/min

$$\text{Removal rate} = \frac{5 \times .8}{1} = 4 \text{ cu in/min}$$

$$\text{Feed} = \frac{4}{3 \times .220} = 6.06 \text{ in/min}$$

Cutter	700 sfpm			Feed per Tooth	900 sfpm			Feed per Tooth
	Rpm	Teeth per Min	Feed		Rpm	Teeth per Min	Feed	
3½" dia — 2 teeth	763	1526	6.06	.0040	981	1962	6.06	.0031
5" dia — 3 teeth	535	1605	6.06	.0038	688	2064	6.06	.0029
6" dia — 6 teeth	445	2670	6.06	.0022	573	3438	6.06	.0018

Fig. 2. Chip loads (feed per tooth) are calculated for three different size cutters, operated at 700 and 900 sfpm, to determine effective use of limited horsepower.

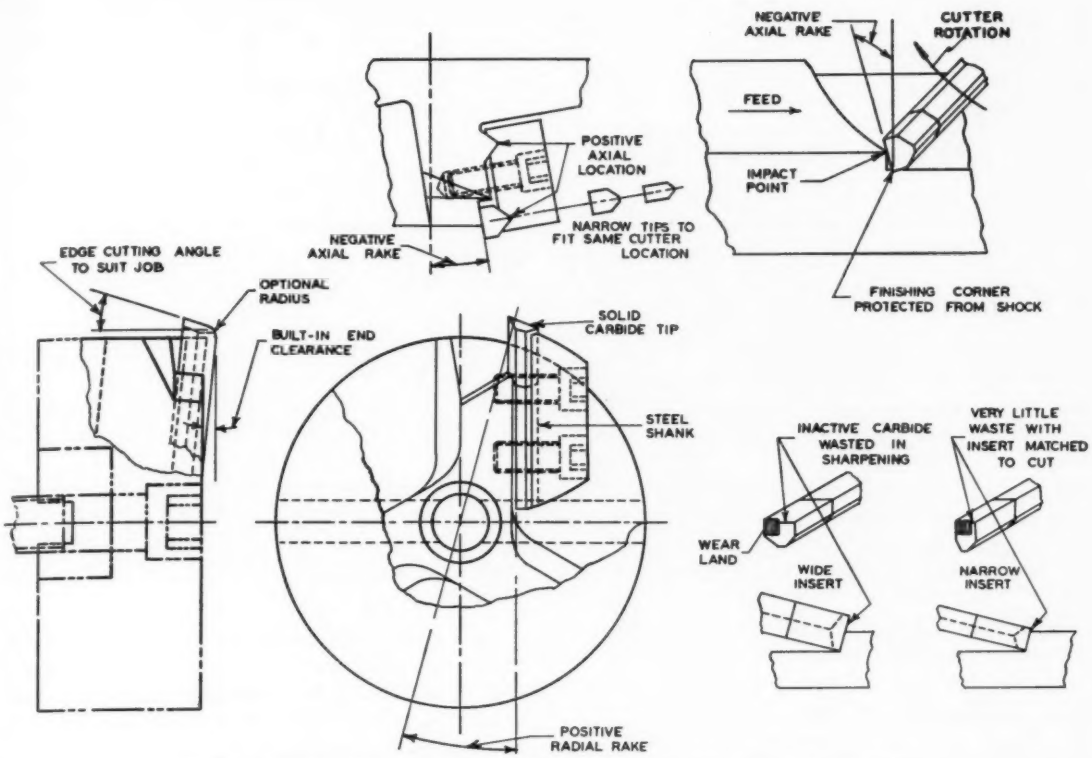


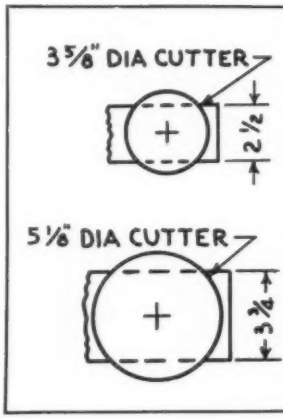
Fig. 3. Drawing shows combination of positive radial rake and negative axial rake for face milling. Also illustrated, top center, is interchangeability of various width inserts to achieve saving in carbide, lower right, when changing from one depth cut to another. View at top right shows that initial impact on entering cut is taken well up on the cutting edge to save the corner for good finishing. Lower right view also shows type of wear that is typical with a tool of this design.

ters have enough feed per tooth to operate efficiently on this job. The six-tooth cutter operated at the 0.220″ depth of cut cannot be fed fast enough to provide adequate chip load, because the power available will not permit more than 4 cu in/min to be removed. As Figure 1 shows, the low chip load would actually waste the already limited power. The cutters with fewer teeth carry chip loads that permit power-saving operation with good wear life. The operation in this case will run better at 700 sfpm than at 900 sfpm, as the lower spindle revolutions give all the cutters a better chip load. If the depth of cut were only 0.100″, however, power would be adequate for a feed of 13.3 ipm and it might be necessary to raise the spindle speed in order to lower feed per tooth for smoother cutting.

Where milling is done with relatively few teeth, premature tool failure must be averted. Most early failure is caused by the shock of engagement at the start of a cut. The proven method for reducing shock in milling is a negative face angle (negative axial rake). In a free-cutting face mill, this combines with positive radial rake to produce the geometry shown in Figure 3. The point of first encounter of the cutter is well able to withstand the impact, being in the midde of the cutting face, while the finishing corner of the insert engages last, and with relatively light load. This combination of angles provides the cutting characteristics necessary for power-efficient face milling of steel.

The authors have run horsepower tests on cutters embodying this geometry and some results are reproduced in Figure 4. The machine used for the tests was a vertical mill built about 1943, and had seen 14 years of multi-shift service without rebuilding. The cutting action during the tests was the same as observed during regular production runs under the same conditions — speed, feed, depth of cut, and material.

Handbooks and textbooks give starting ranges for speeds and chip loads of 350 to 600 sfpm and 0.005″ to 0.020″ per tooth. These figures must be modified somewhat for milling of steel with low horsepower in order to secure satisfactory cutting conditions. For the free-cutting face mills used in this type of operation, and for four common classes of material, the following starting ranges are recommended:



Description of Cut	Insert Cond.	Feed In/Min.	Feed per Tooth	Cu. In. per Min.	Kw.	Idle Kw.	Cutter Kw	Cutter Hp	Hp. per Cu. In. per Min.
.250 Deep Cut 2 Cutter Teeth 1000 rpm, 950 sfpm Test Mat'l—4150 Ann. 195 Bhn, 52 Rock. A	Dull	4¼	.0021	2.66	5.00	2.25	2.75	3.69	1.39
	Dull	8¾	.0044	5.46	7.25	2.25	5.00	6.71	1.23
	Sharp	8¾	.0044	5.46	5.50	2.25	3.25	4.36	.80
.250 Deep Cut 3 Cutter Teeth 445 rpm, 600 sfpm Test Mat'l—4340 As Rolled 220 Bhn, 58 Rock. A	Dull	3	.0023	2.82	6.00	1.70	4.30	5.77	2.04
	Dull	6⅛	.0046	5.75	8.30	1.70	6.60	8.85	1.54
	Sharp	6⅛	.0046	5.75	5.20	1.70	3.50	4.69	.82

Fig. 4. Results of horsepower tests made under various machining conditions.

Low carbon and annealed low-alloy medium carbon steel such as 1018 CR, 1045 annealed, 4620, etc.

800-1000 sfpm — surface speed

0.004-0.008" per tooth—chip load

Medium carbon and alloy steel as rolled, or in normalized forgings

600-900 sfpm — surface speed

0.003-0.006" per tooth — chip load

Abrasive and hard steel such as 1095 or tool steel

800-1100 sfpm — surface speed

0.002-0.004" per tooth — chip load

Work hardening steel, such as 4340

500-800 sfpm — surface speed

0.006" per tooth — minimum chip load

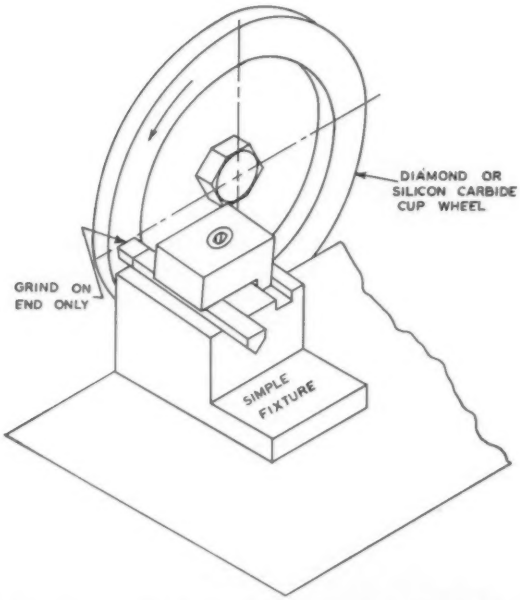


Fig. 5. Sketch shows the simplicity of sharpening teeth. Wear is exhibited only on end (relief face) of insert below the cutting edge. Grinding on this face only reconditions tool for continued service.

These high surface speeds and the free-cutting action of this type tool tend to confine the heat to the chips. The workpiece remains cool and undistorted, and the cutter itself is also cool after making a cut.

In milling operations, tool wear is inevitable. Since limited horsepower machines dictate the use of relatively few teeth for the volume of metal removed, tool life is a serious problem in low-power milling. Two types of expense are encountered — actual sharpening cost and machine downtime. Both must be held to a minimum; for successful results, sharpening must be rapid and inexpensive. Finish will normally be satisfactory at all stages of insert wear and can be improved by using a small radius on the finishing corner (Fig. 3). Feeds per *revolution* of the cutters are low enough to make unusual precautions unnecessary to attain satisfactory surfaces.

Carbides for this type of cutter are selected for edge wear resistance combined with shock resistance. Cratering resistance is less important because of the low chip pressures encountered in a face mill with positive radial rake angles. C-6 industry standard grades are satisfactory for most cuts.

In order to facilitate and speed the grinding and setting of the inserts, sharpening should be necessary on one surface only (Figs. 3 and 5). This requires a radial arrangement of the inserts, and constant width combined with positive, accurate axial location keeps the finishing corners even. Various widths of insert should be usable in the same cutter body, as shown in Figure 3, so as to avoid the waste of inactive carbide in grinding.

To save downtime, the teeth should also be quickly gage-set to cutting position, without removing the cutter body from the machine. Pre-sharpened teeth can be kept ready at the

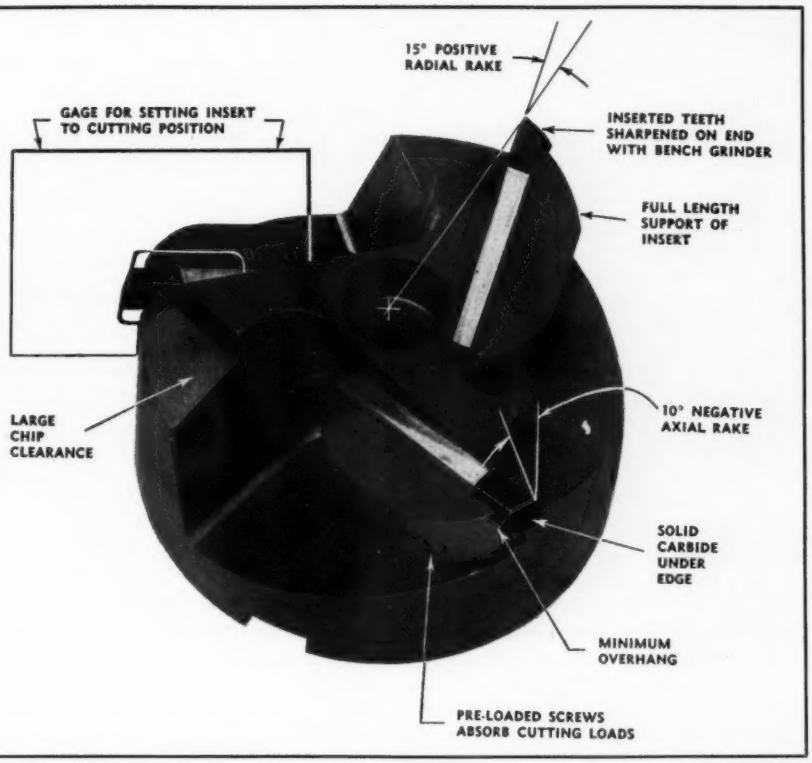

15° POSITIVE RADIAL RAKE
GAGE FOR SETTING INSERT TO CUTTING POSITION
INSERTED TEETH SHARPENED ON END WITH BENCH GRINDER
FULL LENGTH SUPPORT OF INSERT
LARGE CHIP CLEARANCE
10° NEGATIVE AXIAL RAKE
SOLID CARBIDE UNDER EDGE
MINIMUM OVERHANG
PRE-LOADED SCREWS ABSORB CUTTING LOADS

Fig. 6. This 5" OD commercially available face mill, suitable for low horsepower milling of steel, shows the tool geometry detailed in Figure 3, location of the end face that exhibits wear, method of setting inserted teeth to cutting position, fixed axial positioning of teeth, and other design details.

machine to quickly replace teeth in the cutter when dulled.

The relatively low number of teeth employed to keep chip loads high (see Fig. 2) also contributes to rapid edge renewal. The wearing of the cutter on the end (relief face) of the inserts does not affect the cutting action, because the chip is still removed with the original positive rake angle. When the wear lands become $\frac{3}{32}$" to $\frac{1}{8}$" wide, the rubbing of the land on the uncut workpiece causes about a 40% rise in required power. With smaller wear lands the cutting action remains satisfactory; but, between $\frac{3}{32}$" and $\frac{3}{16}$" (depending on work material, depth of cut, speed, and feed), there will be excessive drag, excessive sparking or pounding, and the inserts are then generally replaced.

In machine operations, the lowest time of operation consistent with reasonable tool cost is desired. Where milling power is low, the high cutting speeds of carbides may be utilized by cutters desiged for that type of application. Positive rake cutting angles and flexibility in operating speeds and feeds enable maximum use of the machine's limited power. Rapid insert replacement and low sharpening costs are now available in cutters (Fig. 6) embodying the following features:

- Inserted teeth, sharpened outside the cutter.
- Positive gage-setting of sharp teeth in the cutter body.
- One-surface sharpening of worn inserts.
- Different carbide widths usable in the same cutter body.
- Deep carbide support for the cutting edge.

These features, combined with positive radial rake, negative axial rake, a moderate number of teeth, and the right grade of carbide, are the combination that have extended the use of carbide to machines where it has formerly been thought unsuitable. end

Coming Soon . . .

"The Case for Horizontal Jig Boring"

"Application and Maintenance of Carbide Twist Drills"

"Charts for Determining Milling Cutter Approach and Runout for Rapid Machining"

Recent Progress in

CUTTING TOOL MATERIALS

by William E. Montgomery
Chief Engineer
Carbide Sales Division
FIRTH STERLING INC.
Pittsburgh, Pennsylvania

Increasing demands by Industry for higher rates of metal removal, greater dimensional accuracy, better surface finish, and economical machining of new materials . . . all contribute to the development of new tool materials and new thinking relative to their application.

EVERY SO OFTEN IT BECOMES NECESSARY for a cutting tool engineer to realign his thinking, taking into consideration a new cutting tool material which promises to cut metal more efficiently than the one in common use at the time. Thus, at about the middle of the 18th Century, carbon steel had to be evaluated and put to work, and it soon replaced cast iron and other metals previously used. Carbon steel was not faced with serious competition until almost the end of the 19th Century when the forerunner of a modern high speed steel, Mushet Steel, containing 1½ to 2% carbon, 1½% manganese and 7 to 12% tungsten, was introduced. Then in comparatively rapid succession, Industry was furnished with a wide variety of modern high speed steels, cast cobalt alloys, straight tungsten carbides, and tungsten carbides containing titanium carbide or tantalum carbide or both.

This evolution of cutting tool material has been important and necessary to the success of the modern industrial revolution. Geared as it is to low cost production of consumer goods for mass distribution, Industry relies heavily on our capacity to produce individual parts in quantity to precisely reproducible size and geometry to insure interchangeability, minimize assembly costs, and facilitate maintenance.

The most spectacular feature of this industrial progress as far as its effect on cutting tools is concerned is the ever-increasing speed of operation. Minimum floor-to-floor times demanded by a high production, low unit cost system brought about the development of machine tools capable of generating operating speeds beyond practical limits for older cutting materials. This development, of course, had to be followed by progress in cutting tool metallurgy so that full advantage could be taken of the greater productive capacity of modern machines. In recent years we have seen a situation where tool materials are capable of operating at speeds in excess of those which can be generated in a practical way by available machines. As a matter of fact, this situation has been recurrently prevalent since the advent of carbides.

The reason for this is the fact that tungsten carbides reflect a new concept in metallurgy. Previous materials had been of the wrought variety requiring heat treatment for hardening purposes and so, subject to softening with the application of heat generated in the metal cutting process. Tungsten carbide on the other hand is a product of powder metallurgy and, as such, is not generally thought to be subject to heat treatment under ordinary circumstances.

Support for this belief can be illustrated by the following brief explanation of how today's conventional carbides are made.

The principal ingredient in straight tungsten carbide grades, or the so-called cast iron cutting grades is a compound of tungsten and carbon appearing in the final product as a

powder of fine particle size uniformly distributed in a continuous matrix of binder metal, generally cobalt. In those carbides used for steel cutting operations, additional carbides of titanium, tantalum, or other elements may be used.

A photomicrograph of a typical straight tungsten carbide grade is shown in Figure 1. The more or less regular geometrically shaped parts are the carbide particles, while the lighter areas between show the binder material.

The hardness of the carbide particles is for all practical purposes constant under ordinary circumstances and is retained throughout the metal cutting operations. Cobalt binder itself has a melting point of approximately 2700°F, and this temperature must be approached within 600° or 700° before effective cutting capacity is destroyed.

Much has been written over the last 15 years or so about what can be expected from conventional tungsten carbides described above. A few words are in order concerning what is being done with the new cutting materials, particularly the new harder carbides. We at Firth Sterling feel that the future in machining with these new materials will be confined to some form of more or less conventional carbide, and have accordingly concentrated our efforts in this direction. We are now marketing one grade, WF, having a titanium carbide base, with molybdenum carbide as an alloy carbide addition, and using nickel as a binder.

It may be well to study a few of the factors brought into play by our industrial progress that have necessarily had an important bearing on development and selection of cutting tool materials. An understanding of these factors and a knowledge of what has been done to cope with them would help us all in our approach to today's and tomorrow's machining problems.

The first factor to be considered is the ever-increasing speed of operation. It is generally true that, as operating speed increases, the temperature generated at the tool and chip interface increases as well. It is largely this operating temperature which governs the speed at which any tool material will work efficiently.

As operating speed and temperature increase, there is a proportional increase in the degree to which the cutting material softens.

There is one basic reason why one metal will cut another — this being the fact that the cutting metal is harder than the metal being cut. Operating efficiency depends largely on the difference between the two hardnesses. All known metals and alloys will soften at some

Fig. 1. In this photomicrograph of a typical tungsten carbide grade, the tungsten carbide particles can be seen held in the cobalt binder material (lighter areas).

elevated temperature. The first requirement of a good tool material, then, is that it retain sufficient hardness at operating temperature to cut efficiently.

Cutting tool metallurgy has been aimed at the development of a material which would have this hardness retaining capacity or, as it is commonly referred to, will have good red hardness.

Figure 2 illustrates what has been accomplished toward this end. This curve was based on an arbitrarily established set of cut characteristics for one grade of mild steel merely to illustrate the effect on possible efficient speed by the cutting tool material. Any change in work material or cut characteristics would, of course, change the curve values, but the order of tool performance would remain substantially the same.

It is generally recognized that the temperatures shown in Figure 3 are approximately the maximum temperatures at which the various cutting materials will maintain sufficient hardness to operate with a reasonable degree of effectiveness. Maintaining tools in the cut at temperatures over those listed has the effect of softening the edge to the degree where the work will roll the cutting edge over and destroy proper tool geometry.

It will be noted that the advent of the carbides represented a great step forward in permitting the frontiers of possible operating speed to be pushed back. Reference again to Figure 1 and its explanation will readily show why this is so.

A second factor with a decided influence on recent tool material metallurgy is the modern demand for greater dimensional precision and

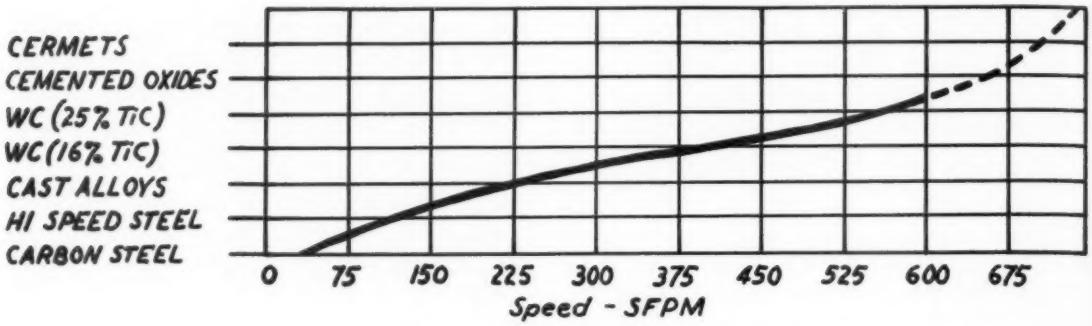


Fig. 2. For a given mild steel work material, cutting speeds at which various tool materials will operate efficiently are shown—other conditions being held constant.

better surface finish. Both conditions dictate the need for a harder, more abrasion resistant cutting tool. This requirement is frequently coupled with the need for higher operating speeds mentioned previously.

Recently, we were asked to try to improve a job involving the turning of a nickel steel bar 16″ dia x 6′ long. It was necessary to keep the tool in the cut for the entire length as no stopping or starting marks could be tolerated. Also, a 32-rms finish was required and the taper, end to end, could not exceed 0.0015″. Conventional carbides had been doing the job at a depth of cut of 0.020″, with a feed of 0.006″ at 200 sfpm. With our new tungsten-free cutting material, WF, we did the job as required but at a new speed of 400 sfpm, and the cutting time was reduced from 4 hrs to 2 hrs. Just out of curiosity, we calculated that on the one pass 9½ miles of chips were removed with only 0.00075″ loss of size on the work. Four complete passes were made before a really noticeable crater developed on the face of the carbide during which 38 miles of chips were removed.

A third factor being brought into play by modern requirements is the need for machining steels at high hardness and high tensile strength values. This tendency is particularly evident in the aircraft industry and is due to that industry's need for materials with high physical characteristics. Here it is necessary to make use of a harder carbide to maintain sufficient spread between the hardness of the material being cut and that of the cutter to insure cutting efficiency. In the aircraft industry, we are now running a job that combines the machining of high hardness steel with the need for extreme dimensional accuracy. The requirement here is the finish turning of a high carbon, high chromium test specimen at a hardness of 52 Rockwell "C". The surface must be smooth without waviness. At a speed of 200 sfpm, the feed runs as low as 0.0025″ and, worst of all, the depth of cut runs from 0.003″ to as little as 0.00025″. In all cases, conventional standard carbides failed to perform because at the lighter cuts they rode over the surface, glazed the work, failed to produce a chip, and wore because of straight abrasion. On the other hand, the new grade WF carbide we tried produced a definite threadlike chip.

In analyzing conditions on a job of this sort to explain the decided increase in performance, it must be concluded that greater hardness has had a definite influence. In studying this detail, however, we observe that between the hardness of the newer material and several of the conventional grades which failed, there is only a fraction of a point difference on the Rockwell "A" scale.

This indicates the need of extreme caution on the part of the tool application engineer in using hardness as the only criterion for carbide grade selection. Because of movement of the carbide particles under the load imposed by the hardness penetrator and the constant hardness of the carbide particles in a given class of carbide, the hardness *reading* is not truly indicative of the actual hardness of the material.

The hardness value assigned to the carbides is more nearly a reflection of the amount of binder phase present, the grain size of the carbide particle, and the metallurgical process applied in preparation.

Another characteristic of the carbides worthy of note is the fact that as apparent hardness increases, there is a disproportionate loss in transverse rupture strength. It would

Tool Material	Max. Operating Temperature
Carbon Steel	400°F
Hi-Speed Steel	1000°F
Cast Cobalt Alloys	1200°F
Conventional Carbides	1800°F

Fig. 3. Each type of cutting material has a maximum temperature up to which it will retain sufficient hardness to operate efficiently.

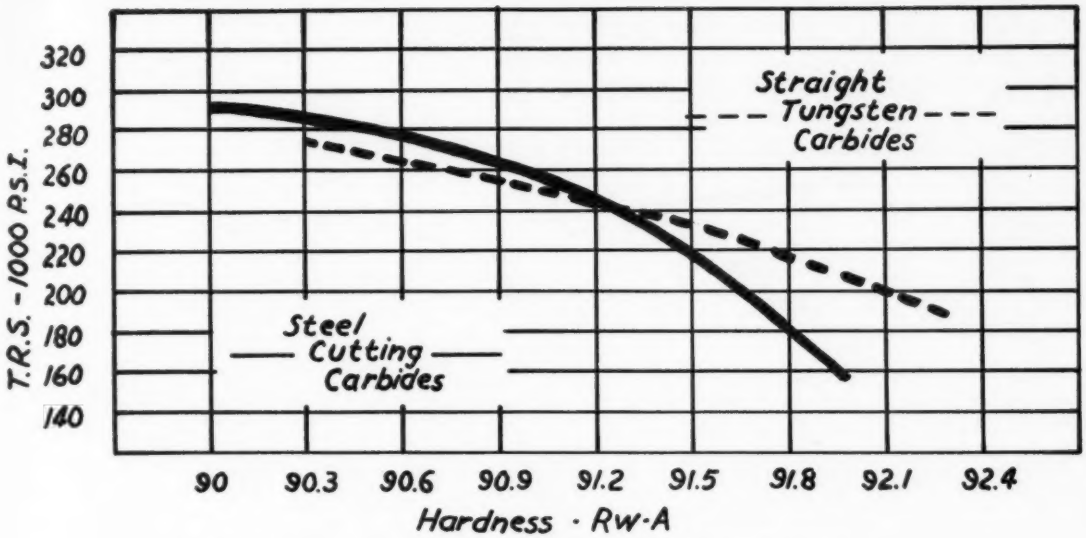


Fig. 4. The transverse rupture strength of carbide tool materials drops sharply in relation to the increase in hardness value.

be advisable for the tool engineer to take this into account. This value reflects the same factors as the hardness value, but the nature of the test is such as to give a wider latitude for selection.

Figure 4 is included here to illustrate the wide range of transverse rupture strength values offered by a selection of typical grades of tungsten carbide, whose hardnesses are all within a total spread of two points on the Rockwell "A" scale.

These show values for conventional carbides both of the straight tungsten carbide variety for cutting cast iron and non-ferrous materials and the more highly alloyed types for cutting steel. The relationship pattern represented for conventional carbides applies also to the newer, harder family of cutting materials. These curves show a spread of about 85,000 psi in transverse rupture for straight carbide grades with a spread in hardness of only two points on the "A" scale. For the steel cutting grades, the transverse rupture spread is 135,000 and, again, the hardness spread is only two points.

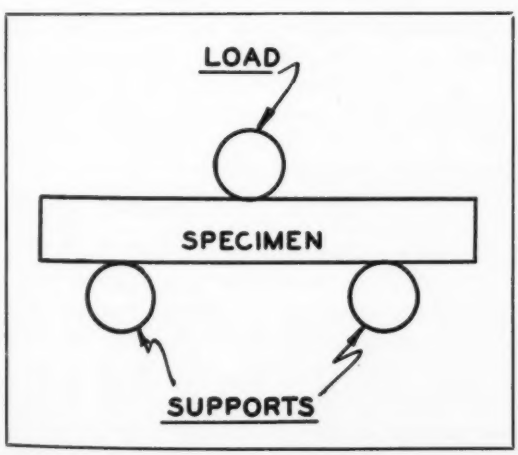


Fig. 5. General arrangement for testing transverse rupture strength of carbide.

The application range covered by these various grades is more accurately illustrated by the variation of strength values than by the hardness spread.

It is necessary to offer the following word of warning regarding the use of transverse rupture values for any carbide. There has been no industry-wide standard procedure established for making this test. Therefore, it is not advisable to make direct comparisons of the data published in literature from various manufacturers. Generally, the test arrangement is similar to that shown in Figure 5.

However, the geometry, size and surface finish of the test specimen, the distance between the supports, the rate at which the load is applied, and the accuracy with which the load is registered, are all critical and must be constant in order to make correlation possible. A standard procedure has now been adopted by the Cemented Carbide Producers' Association, which should ease the problem of comparing values in the future.

While the use of the new family of harder carbides and other new materials has been confined to the recent past and experience is rather limited, there are two characteristics evident which must be recognized and provided for.

First, they are capable of operating at speeds far in excess of those previously possible. Sec-

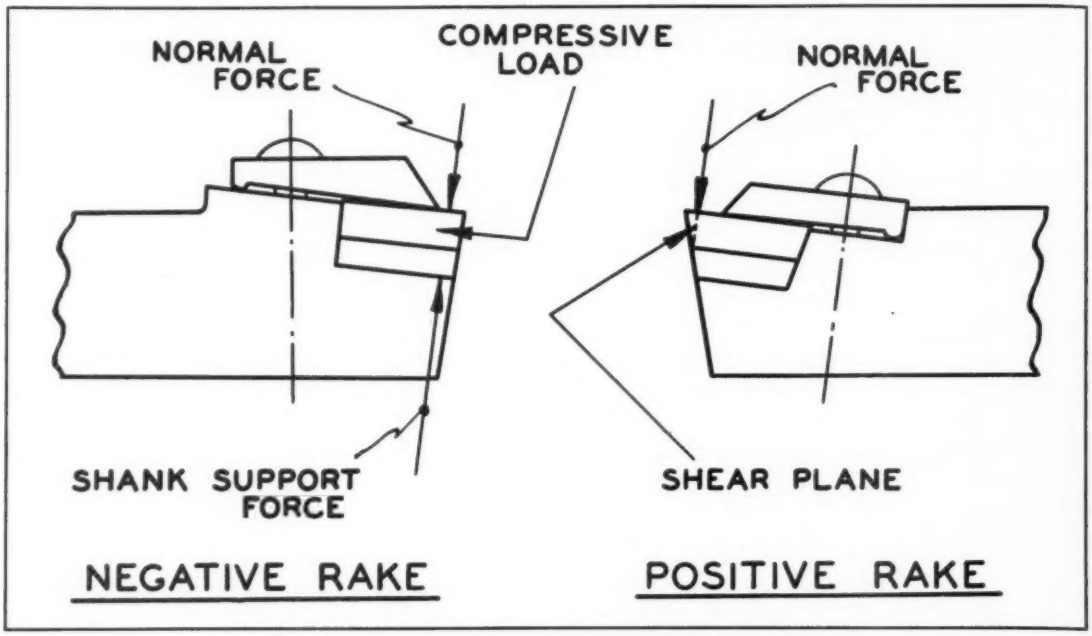


Fig. 6. A negative rake will protect the carbide having a relatively low transverse rupture strength by loading the carbide in compression rather than in shear as is the case with a positive rake.

ond, they are inherently weaker in tension and bending than previous materials and care in their use must be exercised to prevent undue breakage.

It is already apparent that in consideration of these two phenomena certain provisions must be made in order to realize the maximum productivity of our new cutting materials:

1. Machine tools must be made capable of delivering higher speeds to the spindle with completely adequate power to maintain constant cutting velocity.
2. Machine tools, work holding fixtures, and tooling arrangements must be made entirely rigid to eliminate all vibration.
3. Forgings and castings must be better controlled metallurgically and dimensionally to minimize stock removal and to provide optimum machinability.
4. General shop practices must keep pace to take advantage of potential economies made possible by the other phases.
5. Carbide inserts should be mechanically held if at all possible in order to deliver all the strength built into the material to the cutting operation. Because of the different coefficients of expansion between a steel shank and any carbide, the brazing operation induces in the carbide an inherent stress which robs it of part of its original strength. A mechanically held insert, on the other hand, is at rest and its full strength is available for the performance of useful work.
6. Wherever possible, negative rakes should be used. The reason for this recommendation is shown graphically in Figure 6.

The cutting forces on a positive rake tool are applied in such a way as to load the carbide in shear, at least in part. The lack of shank support under the carbide opposite the normal cutting force is conducive to premature breakage.

On the other hand, with a negative rake tool, normal cutting forces are transferred through the carbide to the supporting shank so that the reaction on the part of the shank opposite the force loads the carbide in compression. The compressive strength of any carbide is of an extremely high order and there is no danger of failure because of the compressive loads.

Before applying any of the new harder materials to a cutting operation, the tool engineer should analyze the job thoroughly to establish that their use is justified. Quite often we find that conventional carbides, because of their greater structural strength, can compete favorably on a rate of metal removal basis through establishment of lower operating speeds combined with deeper cuts and heavier feeds.

However, there are now applications peculiarly suited to the new materials, and with improvements in machine tools, tool holders, etc., many more applications will present themselves in the future.

We must learn to make proper use of these materials just as we learned to use conventional carbides of a quarter of a century ago. end

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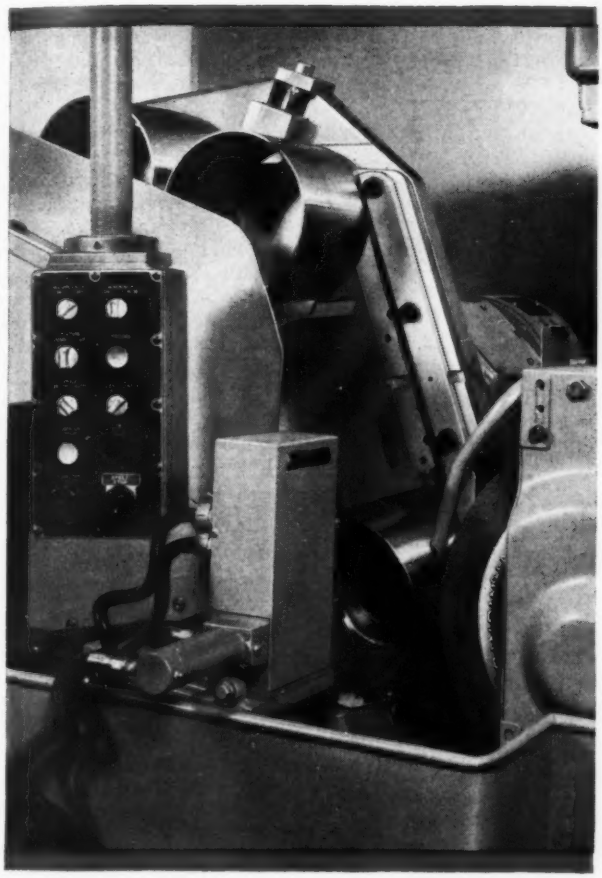

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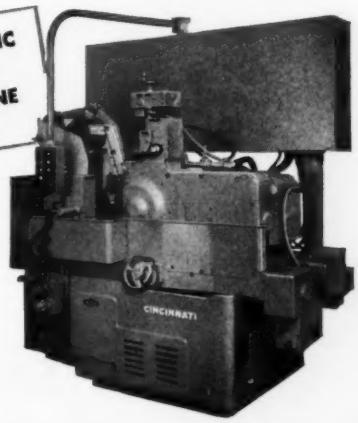

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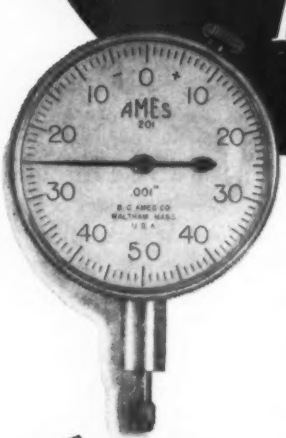

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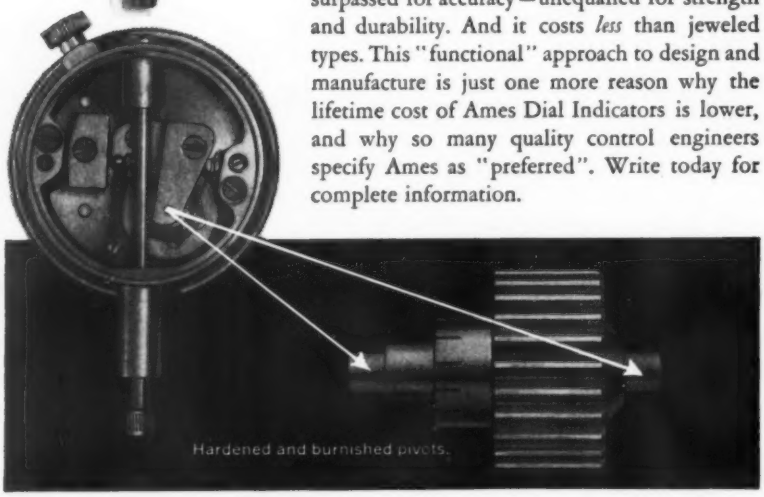
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The development of a joining material and a new industrial technique now makes possible the chemical union of similar and dissimilar nonferrous metals.

Use of this new material, called InterAct, developed by Intertectics, Inc., has introduced a revolutionary change in methods of joining nonferrous metals. It makes commercially feasible the chemical joining of copper and aluminum, until now possible only by mechanical means. The new material also forms a permanent chemical bond through ion exchange between such materials as magnesium, titanium, brass, zinc, silver, and gold.

The resulting joint, usually stronger than either of the metals involved, is frequently greater in corrosion resistance and has similar electrical, physical and chemical properties. The process represents an entirely new concept in the union of metals and cannot be classified as a soldering, welding or brazing operation.

Two thick pieces of aluminum are joined by simply applying heat from a torch until the metals reach reaction temperature at approximately 810°F. InterAct wire, applied at this temperature, provides the eutectic solution which joins the two surfaces permanently in a joint which is stronger than the metals being used.

Chemically, InterAct is a reaction eutectic. This is a material which, under the influence of heat, eliminates the surface oxide layer and causes similar and dissimilar metals to flow together at temperatures lower than the melting point of either metal being used.

The material is produced in three forms. InterAct-S is composed of the chlorides of zinc, lithium, potassium, and sodium, encased in an extremely pure alloy of zinc and aluminum, and is formed in ⅛" OD wire. Both the material and the sheathing play an integral part in the joining process. This material is recommended for tee-joints, butt-

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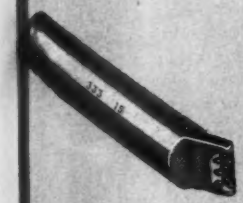

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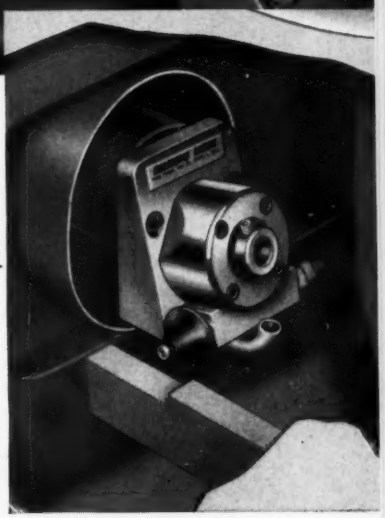
DIAMOND GRIT TOOLS FOR THREAD DRESSING

INDUSTRIAL DIAMONDS

Hydraulic Diamond-Miser DM 1587 • For the new Cincinnati Filmatic No. 2 Centerless Grinder (LO Model). Easy installation. Uses normal hydraulic circuit in machine to automatically index diamond tool on EITHER side of wheel.



Mechanical Diamond-Miser DM 1092, Plunger Operated • For the No. 2 Cincinnati Centerless Grinder (LO Model). Easy installation by drilling 2 holes in grinding wheel housing cover. Adjustable to any width wheel. Models available for EA and OM Cincinnati Centerless Grinders.

You Cut Grinding Costs Automatically with Wheel Trueing's Diamond-Misers

The Diamond-Miser helps you to save on grinding in three ways—by cutting diamond costs—by cutting wheel costs—by eliminating down time for diamond turning.

The Hydraulic Diamond-Miser (above) connects to the hydraulic system of centerless, cam, crank or universal grinders (single or multiple wheel mounts) and indexing automatically provides multiple, accurately-metered diamond facets which are re-sharpened in each pass of the wheel. The built-in concentricity of the Wheel Trueing Diamond Tools is automatically maintained. The Mechanical Diamond-Miser (above, right) indexes through contact of a plunger and bracket at each pass.

Because metering is accurate, there is controlled minimum wear on both diamond and wheel. Dressings are uniform; the wheel much sharper.

The savings on diamonds, on wheels and in time add up to important savings on grinding costs. And, because the whole process is automatic, never forgotten, never neglected—savings, too, are automatic.

Perhaps you can use such savings in your own processes. Would you like to talk with one of our field engineers? May we send you our descriptive booklet?

WHEEL TRUEING TOOL COMPANY

31-3200 W. DAVISON AVE., DETROIT 38, MICHIGAN

ESTABLISHED 1910

Southwestern Plant: Dallas, Texas

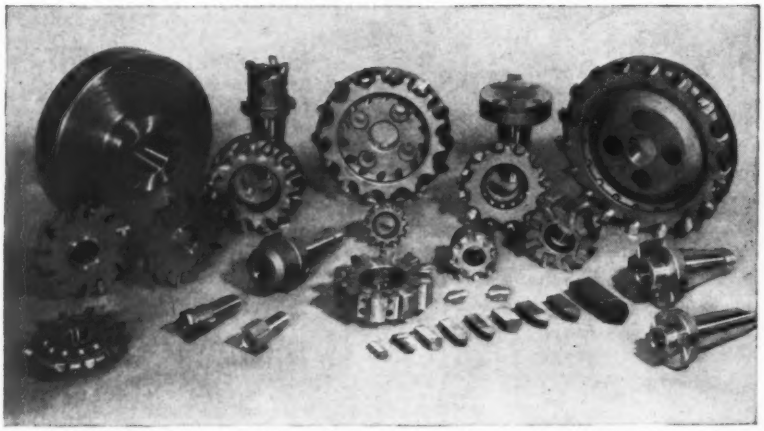
Distributors in Principal U.S. Cities—Agents Throughout the World

WHEEL TRUEING TOOL COMPANY OF NEW JERSEY
33 West Street, Bloomfield, N. J.

WHEEL TRUEING TOOL COMPANY OF CALIFORNIA
5560 Alhambra Ave., Los Angeles 32, California

WHEEL TRUEING TOOL COMPANY OF CANADA, LTD.
575 Langlois Ave., Windsor, Ont.

CIRCLE INFORM-A-GRAM KEY NO. 95



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW

Lovejoy announces the "SHEARJOY", a completely new line of inserted-tooth face mills whose shearing action removes metal at record rates. H.S.S., and Vasco Supreme blades are available.

"Operator reports . . . best milling cutter he ever used on steel." "Prospect buys *Shearjoy* on the spot, after demonstration." "Customer reports 4½" feed at 52 RPM on tough die steel." "Used for 3 shifts without resharpening and without coolant."

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 96

. . . Metals from Page 94

joints, and other exposed-type junctions.

InterAct-E, similar in formula to InterAct-S, is packed in polyethylene bags in powder form, and is recommended for joining broader areas of contact.

InterAct-G, a totally different formula, is composed of aluminum trichloride, zinc chloride, and sodium chloride. It is manufactured in granular form and packed in polyethylene bags. It is recommended for joining foils and other materials where large surfaces are to be brought together at temperatures lower than those available with the use of InterAct-E.

There are three basic methods of use:

1. Manual operation. This involves the operator feeding InterAct wire into the joint, while the joint is heated with a torch. It takes approximately 2 sec to complete the reaction, once the reaction temperature has been reached. It is then flushed with warm water to remove by-products. Under such conditions the operator must be masked, as the material is toxic to skin and lungs.

Two operators demonstrate strength of an aluminum joint which has been made with InterAct. The metal above the joint tears, while the union between the two pieces remains firm.

2. Furnace fed conveyor. In a conveyor operation the materials to be joined are moved on a conveyor through an induction furnace or gas oven where they are heated to a temperature of approximately 810°F. InterAct, formed in ⅛" dia to fit standard industrial welding guns, is fed through a mechanized gun to the joint. Reaction is instantaneous. A water spray is then used to clean the joint. A hooded exhaust system, equipped with a vacuum pump and located over the junction point, vents the fumes to the outside. Since the fumes are water soluble, a water spray renders them harmless before they escape to the outside.

. . . *Continued on page 98*

Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY

UNIQUE NATION-WIDE SINTERING PLANT NETWORK PROVIDES FAST SERVICE ON CARBIDES

Firth Sterling was the first carbide manufacturer to set up sintering facilities at its branch warehouses . . . now has a network of five such plants strategically located to provide on-the-spot service to tool fabricators in the metalworking centers across the nation.

This local service on semi-standard and special carbide shapes, coupled with the broad selection of standard carbides in the Firthite line and the metallurgical skill developed in 30 years of experience with carbide tooling problems, make Firth Sterling a logical source for practical help with carbide applications.

Call your nearest Firth Sterling representative or distributor for specific information on how the sintering facilities can serve you on special tooling problems. Standard carbides, high speed steels and tool and die steels are also available promptly from Firth Sterling's warehouse and distributor stocks.

* * *

Expansion of sintering facilities is another example of Firth Sterling leadership in meeting requirements of the metalworking industry. If you have a metallurgical problem, powder or molten, we are sure we can help you solve it. Please let us hear from you.

FREE Carbide Technical Manual

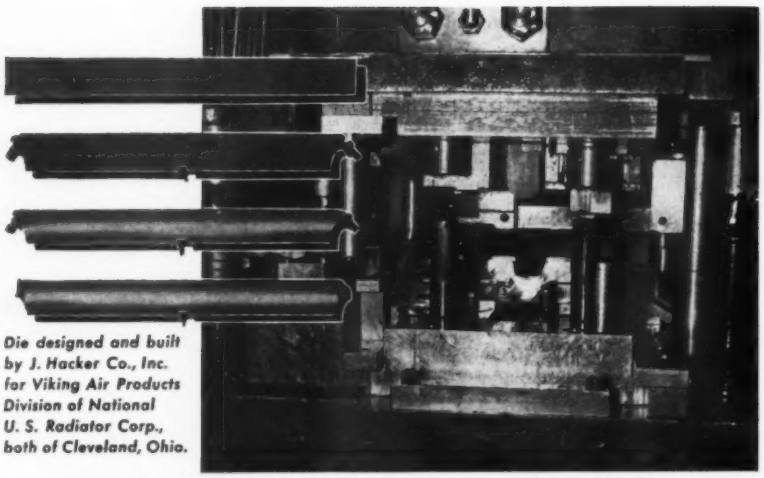
If you use carbide tips, tools, or dies, you'll find the new Firth Sterling Carbide Technical Manual a valuable source of information. Write for your copy today. Firth Sterling, Inc., Dept 11B, 3113 Forbes Street, Pittsburgh 30, Pa. Offices and warehouses in principal cities.

PRODUCTS OF *Firth Sterling* METALLURGY

HIGH SPEED STEELS • TOOL & DIE STEELS • STAINLESS SPECIALTIES • HIGH TEMPERATURE ALLOYS
SINTERED TUNGSTEN CARBIDES • HEAVY METAL • CERMETS • CHROMIUM CARBIDES
ZIRCONIUM • TITANIUM • STERVAC & STERCON SUPER ALLOYS

FIRTH STERLING TRADE MARK

CIRCLE INFORM-A-GRAM KEY NO. 97



Die designed and built by J. Hacker Co., Inc. for Viking Air Products Division of National U. S. Radiator Corp., both of Cleveland, Ohio.

Over 8,000,000 Air Turbine Blades...Still Going Strong!

Darwin **PRK • 33 TOOL STEEL**

4 Stage, Automatic Transfer Die

This is an exceptional example of the fatigue life, resistance to wear and ability to hold an edge, all in *one* die.

No die sections have been replaced—proof of fatigue life. Accuracy still maintained —proof of wear resistance. Average of 609,000 pieces produced between sharpenings—proof of ability to hold an edge.

This is just one demonstration of PRK's superiority. Ask for a Darwin and Milner engineer to show you how this outstanding material can be used to solve your tool steel problems.

Complete Line of highest grade Tool Steels, including PRK-33, DARWIN No. 1, NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Specialty Steels. Furnished in Bar Stock, Forgings, and Sand Castings, Drill Rod, Flat Ground Stock and Tool Bits.

Bulletin on Request.

DARWIN & MILNER Inc.

highest grade tool steels

2345 ST. CLAIR AVENUE ★ CLEVELAND 14, OHIO

• 900 MICHIGAN AVENUE • COLUMBUS, OHIO •

REPRESENTED BY

ZIV STEEL & WIRE CO., CHICAGO • DETROIT • ST. LOUIS • INDIANAPOLIS • TOLEDO • MILWAUKEE • M. G. OPP COMPANY, NEW YORK CITY • PECK STEEL & DIE SUPPLY COMPANY, LOS ANGELES • C. B. WEBSTER, PLAINVILLE, CONN. • C. W. BRINGMAN, ORLANDO, FLA. • SAM BOYER, PHILADELPHIA, PA.

CIRCLE INFORM-A-GRAM KEY NO. 98

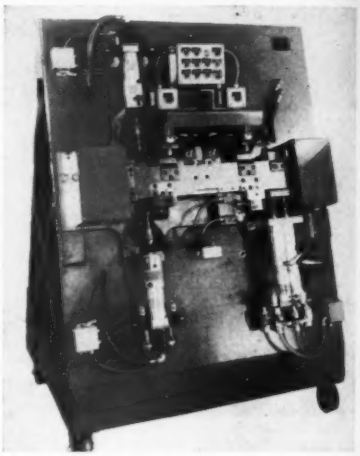
. . . Metals from Page 96

3. Electric strip heaters. When only the areas to be joined are to be heated, electric strip heaters are used. This method lends itself particularly to pre-forming of the wire coils to fit unusually shaped joints. The pre-formed coils can be dropped automatically into place on the joint in a conveyor type operation.

GRILLE PRODUCTION SPEEDED BY AUTOMATIC DRILLING

Machines, designed and built by J. C. Thompson Tool and Die, Inc., drill and countersink six holes in right and left hand die cast radiator grilles at cost-cutting, high production rates.

Indexing of the grille is necessary due to the required close spacing of two sets of the holes. The remaining two holes are spaced so as to be serviced by individual drill units.



Component requirements included substantial safety margins for strength or operating capacity to provide dependability of performance in continuous, 24-hr production. All component-mounting brackets are heavy machine steel, fortified by hardening or added wear plates to provide maximum service-free life.

Mounted on four heavy-duty casters, necessary strength of the assembled machine is achieved with welded channel "A-frame" construction and bridge-member cross bracing.

Working components can be adjusted to perform the work cycle in approximately 4 sec to practical precision tolerances. Electric and pneumatic circuitry controls and related components adhere to J.I.C. Standards.

ACME HYDRIVE

increases production

...and makes a hand operated turret lathe dependably automatic

Acme, with 35 years of experience in the manufacture of drill jig bushings which require precision straight holes, has developed for the industry a hydraulically operated turret drive for powering self-indexing lathes. Hydrive will adapt to turret lathes from bench sizes to No. 5 and automatically operate the turret, feed the cross slide, change spindle speed, advance bar stock, reverse direction of spindle rotation for tapping, and open and close collet.

The reasons for increased production are simple! The uninterrupted operations of Hydrive continue, manned or not, after basic set up. A continual inspection can be maintained while Hydrive operates assuring less rejections in final stages. Hydrive always improves finish and quality of your parts.

For further information check this coupon. Also check for free showing of the Acme Hydrive film.

ACME
INDUSTRIAL CO.
200-222 North Laflin Street
Chicago 7, Illinois

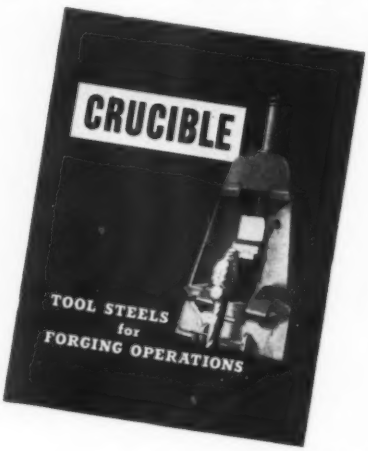
☐ Send me your Hydrive literature.
☐ Make arrangements for us to see your Hydrive film.

NAME_____
FIRM NAME_____
ADDRESS_____
CITY_____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 99

SHOP AIDS

"Tool Steels for Forging Operations" is the title of a bulletin which presents tool steels and heat treatments recommended for dies in drop forging hammers; insert, extrusion, and preloaded dies in presses; gripper dies and header dies or punches



in upsetters, etc. Specifications and observations of the steels are outlined in chart form. Crucible Steel Company of America, The Oliver Bldg., Mellon Square, Pittsburgh 22, supplies copies of the bulletin, or — **Circle Inform-A-Gram No. C1.**

"Lower Manufacturing Costs" shows where and why some high production costs may be due to waste. Inspection by Magnaflux methods is explained and the bulletin shows how this service can save money, time, and labor. Case studies are included. The bulletin is made available by Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, or — **Circle Inform-A-Gram No. C2.**

A Ductile Cobalt-Base Alloy for high-temperature service, Haynes alloy No. 25, is reviewed in a bulletin. The bulletin contains sections on physical properties, short-time tensile data, and stress-rupture and creep data. A separate section describes methods for welding, forming, and machining the alloy. Contact Haynes Stellite Co., Div'n of Union Carbide Corp., 30-20 Thomson Ave., Long Island City 1, N. Y., or — **Circle Inform-A-Gram No. C3.**

"Mechanical and Hydraulic Hand Lift Trucks" is a brochure that answers the four prime questions — what they are, how they operate, how to select, and how to use. The brochure explains and illustrates the two types of hand lift trucks: skid type and pallet type. The basic principles of lifting mechanisms are reviewed: single or multi-strike mechanical, or hydraulic. For your copy of this brochure write to the Association of Lift Truck and Portable Elevator Manufacturers, Suite 759, One Gateway Center, Pittsburgh 22, or — **Circle Inform-A-Gram No. C4.**

The Fundamentals and Essentials of precision measuring and inspection are presented in a leaflet. It discusses the differences between optical and mechanical inspection instruments and will aid the inspector in selecting the proper instrument for the inspection work to be performed. Copies are available from Opto-Metric Tools, Inc., 137 Varick St., New York 13, or — **Circle Inform-A-Gram No. C5.**

A Stock Chart on precision ground tool steel contains available sizes and other information. Designed as an aid for shop, engineering, and purchasing personnel, the chart contains analyses, hardening instructions, temperature curves, and surface finishes. Uddeholm Company of America, Inc., 155 E. 44th St., New York 17, supplies copies of the chart, or—**Circle Inform-A-Gram No. C6.**

The Ballizing Process, forcing a ball through a part for hole sizing and/or finishing, is explained in detail in a technical bulletin and catalog. Typical applications are described and tables are included giving performance, production, and cost saving data. A line of ballizing equipment is shown in actual use, ranging from a service and repair tool to a semi-automated operation. Copies of Catalog BZQ-11 is published by Industrial Tectonics, Inc., 3686 Jackson Rd., Ann Arbor, Mich., or—**Circle Inform-A-Gram No. C7.**

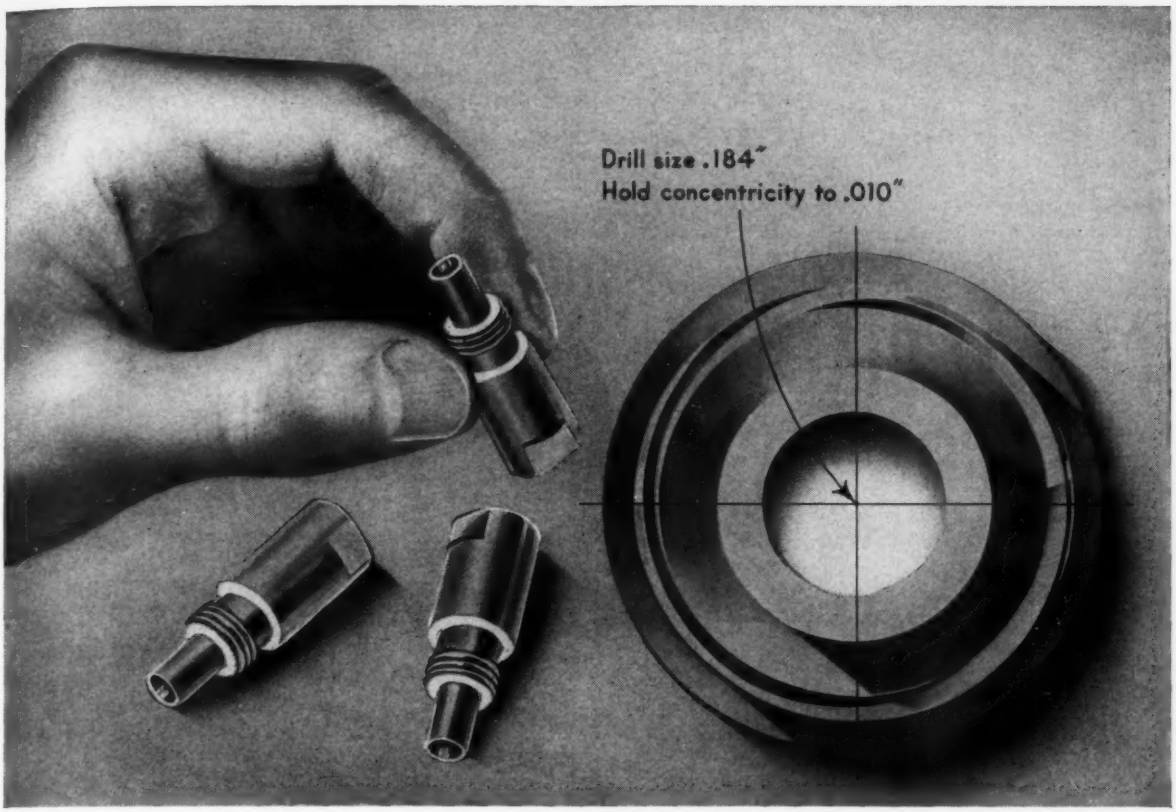
How to Make a Quality Root Pass with consumable insert when welding from one side, is explained in a bulletin. It compares conventional methods of producing a root pass to the use of consumable EB weld inserts. 15 different insert compositions are classified for the welding of carbon steels, austenitic stainless steels, non-ferrous alloys, and chrome-moly, and chrome steels. Write to Arcos Corp., 1500 S. 50th St., Philadelphia 43, or — **Circle Inform-A-Gram No. C8.**

A Carbide Technical Manual is available from Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30. The manufacture and physical properties of tungsten carbide, Firthite grade selection and application, the use of single point tools, and recommended Firthite cutting speeds are featured. Graphs, pictures, and drawings are included. Write to the company for your copy, or — **Circle Inform-A-Gram No. C9.**

Specification Sheets on two types of zinc alloy fasteners have been released by Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N. Y. Each fastener is described on a separate data sheet which lists complete dimensions, finish, and material information. One, the capped wing nut with a closed threaded section like a regular cap nut, protects bolt ends. The other, washer base wing nut, replaces a regular wing nut and flat washer. Write to the company for the data sheets, or — **Circle Inform-A-Gram No. C10.**

Weight Tables of Round Steel Tubing are given in a booklet published by Revere Copper and Brass Inc., Rome Mfg. Co. Div'n, P. O. Box 111, N. Y. An additional page of the revised bulletin gives instructions for determining weights for square and rectangular tubing. Tubing comes in ¼" to 5" ID, in round, rectangular, and square shapes. Features of the welded steel tubing include uniform wall thickness, dimensional, accuracy, adaptability, ease of fabrication. Write to the company for copies of this bulletin, or — **Circle No. C11.**

How Anaconda can help you get the exact Rod to fit the job



THE broad line of Anaconda free-cutting copper and copper-alloy rods gives you widest latitude in selecting from warehouse stock the precise rod for most screw machine jobs. But every once in a while there are special requirements.

One company's problem: The M. J. Grass Screw Machine Products Co., Buffalo, N. Y., machines a part for a gas-burner base from ½" round free-cutting brass rod. Specifications call for a hole $1\frac{1}{16}$" deep by .184" in diameter—with concentricity held to .010".

With standard free-cutting brass rod the drill had a tendency to wander, running the concentricity off as much as .024". To correct this, The American Brass Company provided rod stock with a minor variation in fabrication for deep drilling. This free-cutting brass rod has a slightly harder core, which minimizes the tendency of the drill to run off center at the high drilling speeds used. Now M. J. Grass holds the concentricity to .008" or under. With regular free-cutting brass, rejects ran as high as 15%. With the deep-drilling rod, there are no rejects.

Your requirements: Anaconda Rods are consistently uniform in composition, temper, and free-cutting characteristics. Consequently, they make possible easy duplication of cutting speeds and feeds known to be satisfactory from previous job records.

When you need special physical characteristics, such as a harder core for deep drilling or additional ductility to permit spinning or cold forming after machining, either the temper, the alloy, or both can be adjusted to meet your requirements.

Free technical service: It is the function of the Technical Department of The American Brass Company to assist metal users in the solution of special problems. This service is at your disposal without charge.

Comprehensive data on composition and machinability of standard Anaconda Alloys, standard specifications, weights, and dimensions of standard rods is available in Publication B-3. For this booklet – for special technical assistance – write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 8770

ANACONDA® RODS FOR SCREW MACHINE PRODUCTS
MADE BY THE AMERICAN BRASS COMPANY

GROWING PAINS

A 1,300,000-sq-ft automobile assembly plant will be built by **Chrysler Corporation** in St. Louis. Completion is scheduled for the spring of 1959.

Ford Radio & Mica Corporation is modernizing its plant. Among the plans for the plant are the semi-automation of high-precision mica stamping and fabrication, operations now manually controlled, and refinement of raw material and finished product quality control systems.

◆

Physical expansion of **American Can Company** facilities last year totaled 1,500,000 sq ft in 15 locations. More than half of the total space is for housing new equipment for Canco's coil processing program.

GEM-17 DIAL INDEX TABLE

TRUE GENEVA MOTION

FOR FAST, *ACCURATE* AUTOMATION OF ASSEMBLY *and* MACHINING OPERATIONS

This new, high precision index table is accurate to plus or minus 0.001 in. on a 13 in. dia. work circle; can position work in as little as 1/2 sec.; indexes a 1,000 lb. fixture load.

High volume manufacturers find it versatile in automating drilling, tapping, riveting, spinning, staking, knurling, chamfering, welding and screw driving machines, gaging devices and other operations. GEM-17 builds profits through savings in time, labor and materials.

BASIC SPECIFICATIONS: Standard Number of Stations—6, 8 or 12; 3 and 4 skip. Motor—Rotary air, fluid, or electric. Dial Plate-17 in. dia. standard; larger plates available. Rotation—Either direction. Interlock—Limit switch operated directly off locking bolt. Weight—200 lbs.

Gray engineers will help you adapt GEM-17 to your use. For recommendations, send specifications of your application. Illustrated brochure DI-17 and prices on request.

GRAY EQUIPMENT COMPANY

13600 Ford Road • Dearborn, Michigan • Telephone: Tiffany 6-7573

CIRCLE INFORM-A-GRAM KEY NO. 102

A 20,000 sq ft light manufacturing plant is being constructed by **Controls Company of America.** It will house expanded operations of its wholly-owned subsidiary, Lake City, Inc. Automatic timers and synchronous timing motors will be manufactured at the $180,000 project.

◆

Burgmaster Corporation, Small Tool Division, Burg Tool Manufacturing Company, Inc. has announced the opening of a new plant in Gardena, Calif. The facilities are devoted solely to large scale production of bench model drilling and tapping turret drill.

◆

Michigan Chrome and Chemical Company announces breaking ground at the Grinnell Avenue plant in Detroit for a new 18,000 sq ft laboratory addition. The new quarters will provide laboratory facilities for both the Plating and Chemical Divisions of the company. Separate laboratories will be assigned to plating control, new products research, chemical products development, and technical service. Occupancy is scheduled for March.

◆

Construction has begun on a new plant for **Lodding Inc.** It will have 52,000 sq ft of manufacturing space and 12,000 sq ft of office space. In process is a development laboratory for designing components for automatic tooling systems.

◆

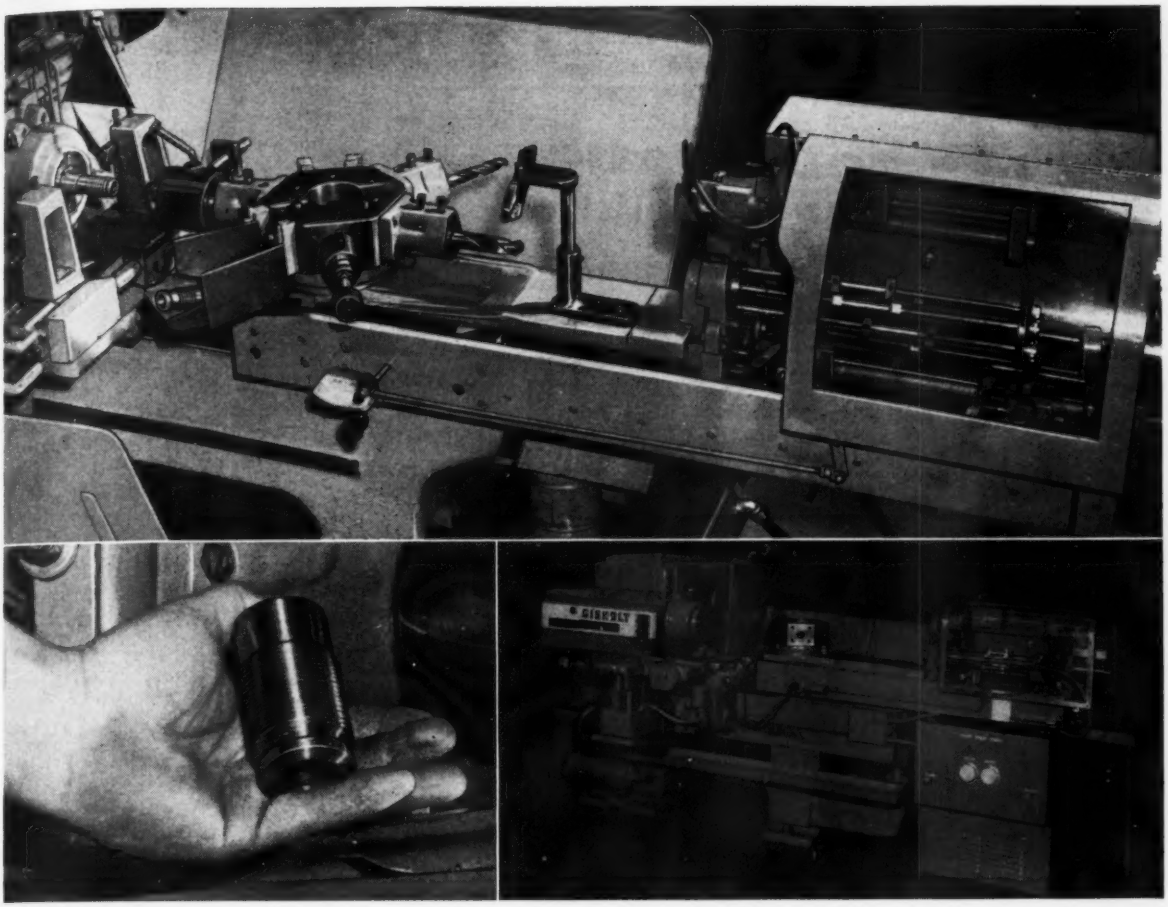
General office, private offices, and drafting room will be contained in the new office building being constructed by **Sentry Company.** By housing the offices in a separate building adjoining the plant the company will make space available for expansion of factory facilities.

◆

Crucible Steel Company of America has announced the company's establishment of a new applied research laboratory, to be located at Crucible's Sanderson-Halcomb Works in Syracuse, N. Y.

◆

Calumet Steel Division of **Borg-Warner Corporation** has completed plans for a multi-million dollar expansion and improvement program at its facilities in Chicago Heights. The first part of the program, to be completed in 1959, provides for increased capacity of 40%, construction of a combination rail, axle, and billet heating furnace and other equipment for shops. The second phase of the program contemplates installation of electric furnaces and additional rolling and finishing facilities.



250% Production Increase with this setup

Gets full automation on small job-lot production runs using hydraulic drive on Gisholt Ram Type Turret Lathe

Floor-to-floor time on the job shown here—a threaded collar 3⅛" long with 1 1/16" diam.—was cut from 8.1 minutes (with hand operation) to just 3.25 minutes. All operations and machine functions are automatically controlled with the Lynn Hydraulic Drive Unit on a Gisholt Ram Type Turret Lathe.

Here's how the finished workpiece is completely machined from bar stock in one fast, automatic operation: The stock is fed pneumatically against a turret stop, chucked, start-drilled, then finish-bored with a large drill. The hydraulic drive backs the drill out automatically to clear the chips, then rapid traverses back to where it left off before dropping into feed to resume drilling. Spindle speed automatically decreases as tools on the front cross slide form the O.D., drops into lower speed as O.D. is threaded, and into another low speed as radii are formed on the finished part and on the end of the bar stock. A tool on the rear cross slide cuts off the finished part and the job is done in record time.

With its massive design, reserve power and extra spindle speeds, the new Gisholt MASTERLINE Ram Type Turret Lathe is particularly adaptable to complete automatic operation with Lynn Hydraulic Drive. Contact your Gisholt Representative. He has the complete facts—and his wide experience may point the way to more profitable operation for you.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

WRITE GISHOLT TODAY for all-new, 18-page illustrated Bulletin 1174-B covering features, accessories, tools and floor plans on new Gisholt MASTERLINE Ram Type Turret Lathes.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY REBUILT MACHINES WITH NEW MACHINE GUARANTEE

CIRCLE INFORM-A-GRAM KEY NO. 103

DALZEN

2 in 1 COMBINATION
CENTER GRINDER AND DRILL PRESS

A drill press and center lapping machine at less than the cost of many single purpose center grinders! In addition to savings on equipment costs, the Dalzen "2 in 1" permits maximum man-hour production thereby keeping your unit cost at a minimum!

1 SIMPLE OPERATION CHANGES CENTER GRINDER TO DRILL PRESS

Center grinder to drill press or drill press to center grinder in a matter of seconds! Simply unlock clamping handle and swing diamond dresser in or out of position! Photo at left shows center grinder in dressing position. Photo above shows center grinder at work.

A full 43" capacity from base to spindle . . . dresser adjustment from 20° to 100° included angle . . . drills to center of 15" circle . . . maximum lapping stone dia. 3".

THREAD GRINDER

Average Set-Up Time 30 Minutes!

Saves Floor Space! Low Cost!

Excellent for tool room and production Thread Grinding. Easily set-up from job to job! Has built-in relieving attachment as standard equipment for grinding of taps. This remarkable machine may also be used to grind angles, grooves and surfaces where concentricity is an important factor!

Dresser and wheel head are self-compensating. Size of work is automatically maintained after dressing of wheel regardless of how much is dressed off.

The grinding and regrinding of thread rolls up to 3" in diameter and thread milling cutters can also be ground with special attachment.

WE ALSO SPECIALIZE IN THREAD ROLLING DIES AND THREAD HOBS
LITERATURE ON REQUEST

DALZEN MANUFACTURING CO.
4600 BREE ROAD, DEPT. TP-2
ST. CLAIR, MICHIGAN

FILMS TO SEE

"Modern Wire Processing" is a 15-min 16mm color motion picture on an automatic wire cutter and stripper. The film shows in detail the action and operation of the machine, which will cut and strip 12 ga to 32 ga insulated wire in lengths from 1" to 300', at speeds up to 8,000 pcs/hr. The film is for free loan from Eubanks Engineering Co., 260 N. Allen Ave., Pasadena, Calif.

◆

A movie demonstrates the use of two power drill attachments. The 6-min film shows a reversible speed reducer for ¼" portable drills for heavy duty screw driving and removing; for nut running, on or off; and for powering heavy duty cutting tools. It also shows the uses of a tapper. Contact Supreme Products Corp., 2222 S. Calumet Ave., Chicago 16, for the demonstration movie.

◆

Two movies are offered by Clearing Machine Corp., 6499 W. 65th St., Chicago 38. "Automation Comes of Age" is a 16-min color movie showing a complete line of automated press equipment including a modular transflex press, transflex feeds, and moving bolster presses. "Modular Automation," a 14-min movie, shows the modular transflex press in action.

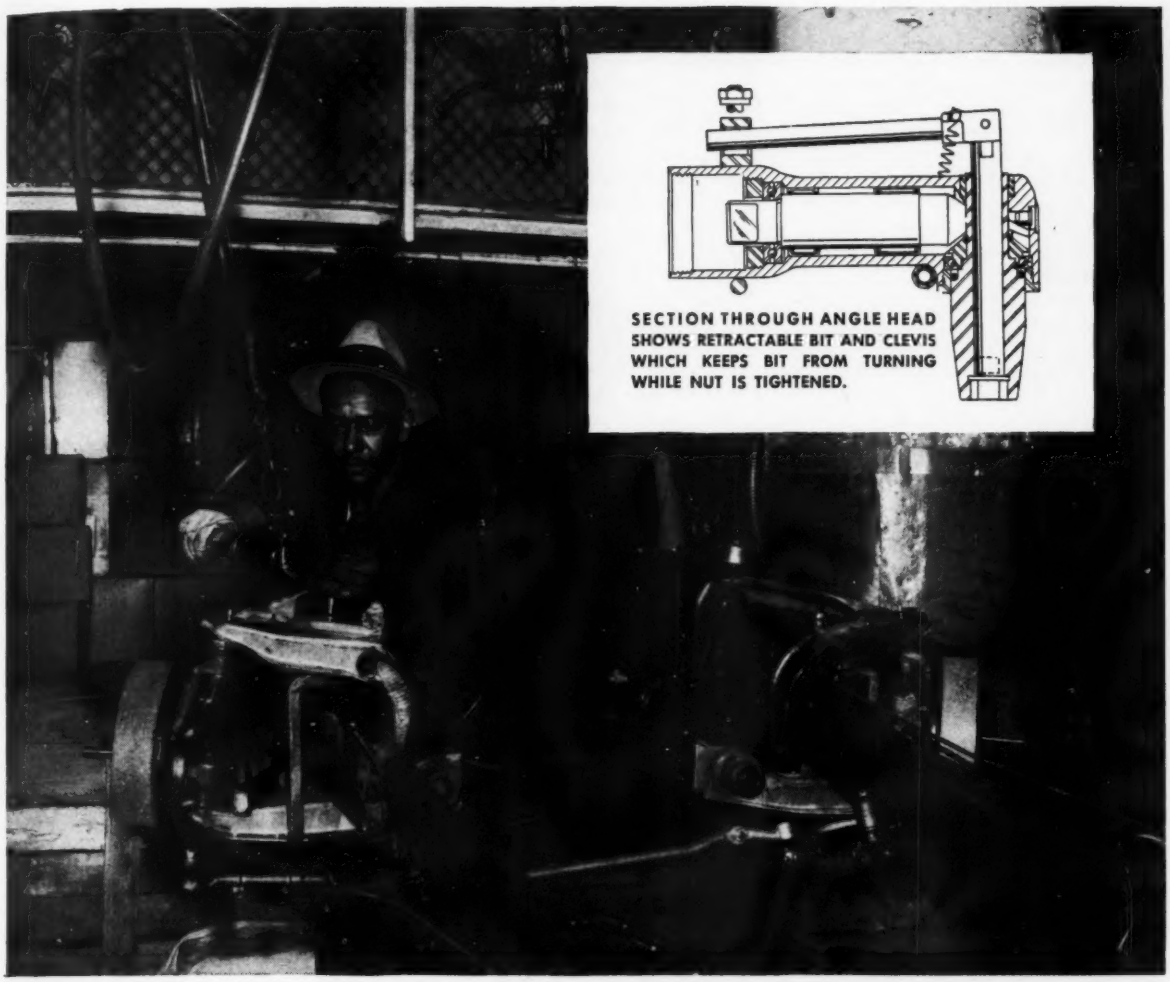
◆

Hearing problems are the subjects of a series of three half-hour color films entitled "Noise and Hearing." Part one, "How We Hear," defines the loss of hearing problem in terms of public health and safety; "The Nature of Sound" explains the physics of sound; and "Noise Control" presents methods of industrial noise measurement and analysis. Write to Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, for copies for free loan.

◆

"Hydraulic Oils" is a 25-min film showing the principles of hydraulic laws and demonstrating the part premium oils play in getting increased production from the hydraulic applications. The characteristics of premium hydraulic oils and their effectiveness are presented. For further information, write The Texas Co., 135 E. 42nd St., New York 17.

CIRCLE INFORM-A-GRAM KEY NO. 104



SECTION THROUGH ANGLE HEAD SHOWS RETRACTABLE BIT AND CLEVIS WHICH KEEPS BIT FROM TURNING WHILE NUT IS TIGHTENED.

Unusual production line problem solved by specially adapted air tool

This operation is unusual in that the nut must be run down and tightened on the slotted, headless shock absorber adjusting screw *without turning the screw itself*. With the specially adapted Gardner-Denver 16C angle nut setter, a retractable stationary blade (such as a screw driver bit) inside the socket keeps the screw from turning.

Cuts production time

Hand tools are usually employed for this type of operation. However, the versatile angle nut setter easily does the job in a fraction of the time required by hand methods. It also holds torque within commercially required limits.

The above example is typical of special problems that Gardner-Denver's Keller tools solve for production men. If a standard tool isn't available for a particular application, Keller specialists will work with your tool engineers on an adaptation to fit the job. Write your Gardner-Denver representative for complete details.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

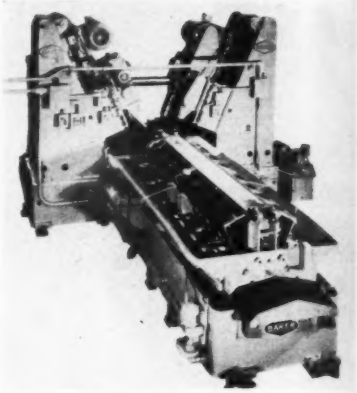
CIRCLE INFORM-A-GRAM KEY NO. 105

SPECIAL MACHINE CONSTRUCTED FROM STANDARD COMPONENTS

Rough and finish boring and spot facing welded steel diesel engine cylinder blocks, prior to insertion of sleeves, are performed automatically on this special machine. The part automatically indexes on the shuttle table, and the cycle is completely automatic. The machine is designed for 16, 12, 8, or 6 cylinders. Opposing holes are finished simultaneously.

Built by Baker Brothers, Inc., the machine is designed to use two standard 2050 Baker basic slides with 50-hp worm drive boxes for boring and counterboring the cylinder sleeve holes. Two standard 115 Baker basic slides with 5-hp bevel gear drive boxes drill dowel pin holes.

The fixture is mounted on the shuttle table and the cylinder block



is hand clamped. Carbide tipped single point tool bits are used for rough and finish boring and counterboring.

RIVETT LATHE with *Buck* AJUST-TRU® CHUCK "Saves 50% on set-up time"

The Rivett Lathe & Grinder, Inc., Brighton, Mass., makes this report on the performance of Buck chucks.

"We use Buck chucks in our tool room because they save 50% in set-up time and require 95% less indication.

"The non-marking and concentric grip characteristics of the Buck in chucking thin wall tubing make them a "must" for tool room work."

It pays to chuck with Buck! Send for catalog — see why.

The Buck line includes Scroll, Power, Compensating, Independent chucks, Boring Bars.

BUCK TOOL COMPANY

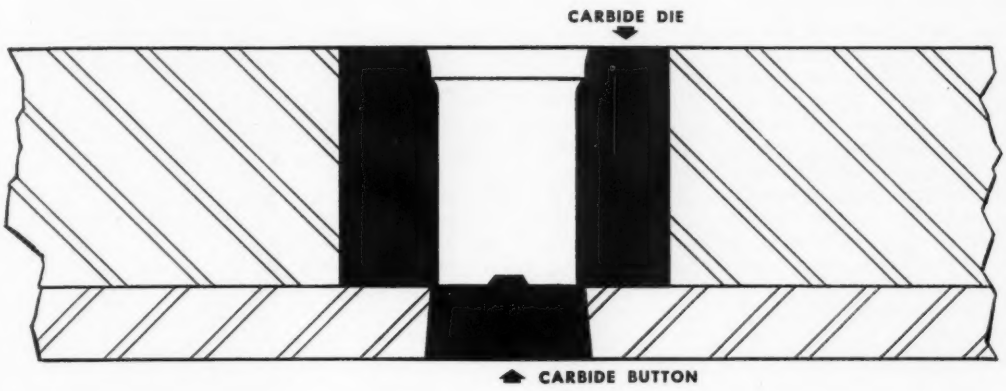
218 SCHIPPERS LANE • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 106

LOADING HEAT TREATING FURNACES AUTOMATICALLY

Automatic feeding of slugs into induction heaters for heat treating is the function of the new special model 2500 Feedall magazine feeder. The unit feeds 2" x 3½" slugs into a heat-treating machine at pre-determined speed and has automatic shut-off controls. The large hopper provides storage capacity for variable parts

flow rate. Angle of elevation, depth of cleats, and machine speed can be adjusted to feed rolling or sliding parts into a broad range of high-speed production machines. The feeder, built by Feedall, Inc., is entirely self-contained, and its work range includes rolling parts up to 5" in dia, 1½" long, or sliding parts 2" in dia, 6" long.



Cross section of Carboloy carbide-equipped die used by Federal Drop Forge Co. The die cold-extrudes SAE 1010 steel blank (A) into ball seat (B) for automotive steering mechanism.

Cold-extruding 1010 steel ball seats . . .

AN EXTRA DAY'S OUTPUT EVERY 3 DAYS WHEN CARBOLOY® DIES REPLACED STEEL

Carboloy cemented carbides are harder than steel — and far more resistant to wear. That's why carbide-equipped cold-extrusion dies save an average of 2½ hours of press downtime *per shift* at Federal Drop Forge Co., Lansing, Michigan.

When steel dies were used, they were polished each shift . . . and the button (see diagram) had to be reground. Time lost: 2½ hours per shift, or the equivalent of one working day every three days. Steel die life averaged 25,000 pieces; steel buttons produced about 15,000 pieces per grind.

Now that Carboloy carbide dies and buttons are used, only occasional polishing is required. One die has produced almost 1 million extrusions in 2½ years with only .0003″ wear . . . and carbide button life averages 2 million pieces.

In addition to longer die life, a costly centerless grinding operation was eliminated because, with carbide dies, specified tolerances are held from beginning to end of the run. And, the surface finish after extrusion is better than previous centerless-ground finish.

The unique properties of Carboloy cemented carbides can be used just as effectively on drawing, forming, or blanking operations. Check with your diemaker for more information. Or write: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Avenue, Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

CIRCLE INFORM-A-GRAM KEY NO. 107

MACHINE CHECKS CYLINDER BLOCKS FOR THIN WALLS

To determine whether V-8 cylinder blocks have any walls that are too thin, as a result of core shifting during molding, a new Baker special machine has been developed for checking this condition on its first operation. By checking the blocks before machining, both material waste and lost time are eliminated.

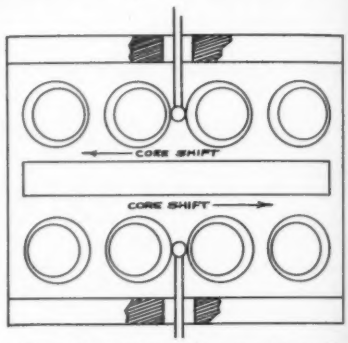
During molding, the water jacket core sometimes shifts endwise in relation to the cylinder bore cores. This produces a cylinder wall which is thin on one side and thick on the other. In order to compensate for this shift and to maintain a minimum permissible wall thickness, the block must be located from the water jacket side for cylinder boring.

Also, the core on one bank of cylinders may shift a different amount than the core on the other. Therefore the block location must be an average.

This special machine automatically checks the wall thickness (tolerance ±0.001") and locates the block to maintain the desired minimum. If this minimum wall thickness cannot be maintained, the block is automatically rejected and painted for identification.

Special machine for checking cylinder walls to determine whether they are too thin.

If the block is acceptable, the vertical head advances and drills two manufacturing holes in the block.



Two electronic probes are inserted through the Welsh plug holes to measure the cylinder wall thickness on the water jacket side. A computer automatically positions the blocks so that boring will average out the difference in thickness.

The head then withdraws and the block is shuttled to the next position for reaming these holes.

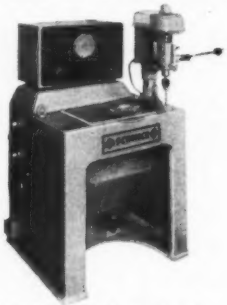
After reaming, a mechanical turnover flips the block for subsequent operations.

Transfer is completely mechanical through a ball nut and screw. All controls are by Cypak static switching, manufactured by Westinghouse. The circuit and machine are of Baker Brothers design.

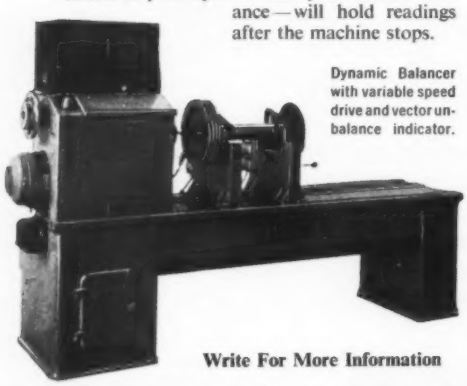
Initial production from the new Toronto, Ohio, plant has been announced by Titanium Metals Corporation of America. This facility is devoted exclusively to rolling and forging titanium. Billets and large rounds are being shipped while engineering continues on installation of sheet mills.

PRODUCTION . . . BALANCING
WITH
SCHENCK
ELECTRO-DYNAMIC BALANCING MACHINES

Schenck Electro-Dynamic Balancing Machines offer many unequalled advantages of speed, sensitivity, accuracy and ease of operation. They will automatically indicate dynamic or static unbalance on rotating parts (1) in a single run of less than a minute, (2) without adjustment of springs or protractor dials, (3) without the need for electronic tubes or amplifiers, (4) to as little as .00002" (twenty millionths) displacement from center of gravity. The watt-metric measuring circuit is immune to non-unbalance vibrations—gives positive plane separation—permits calibration of indicator readings in any measuring unit—provides separation of pure dynamic and pure static unbalance—will hold readings after the machine stops.



Static Balancer with associated drilling unit.



Dynamic Balancer with variable speed drive and vector unbalance indicator.

Versatility Choice of either a component meter for predetermined correction spots, or a Vectormeter for correction in any angular location. Rotor is driven by drive shaft, belt, or compressed air, or may run under own power. Any power combination possible.

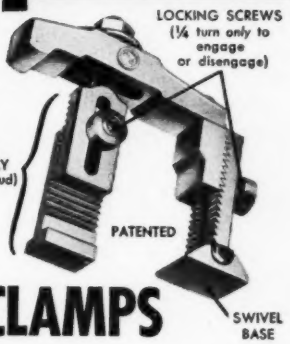
Measuring Ranges (Rotor weight) Horizontal Balancers—from .25 oz. to 220,000 lbs.; Vertical Balancers—from .2 lbs. to 1100 lbs.

Write For More Information

COSA — nationwide sales and service of precision machine tools—from bench lathes to boring mills.
COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 108

Hi Lo



self-contained...
rapid adjustable CLAMPS

• Designed to overcome three major clamping problems . . . time consuming . . . bolt stripping waste . . . and unsafe set-ups. • All component parts stay integral—NO LOOSE PIECES • All parts are steel forging, heat treated for maximum toughness • Serrated bolt and step block adjustment design provides rigid, parallel clamping for safe set-ups

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Hi Lo **Hi-Lo PRODUCTS COMPANY**
Div. of Steel City Testing Machines, Inc.
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CIRCLE INFORM-A-GRAM KEY NO. 1091

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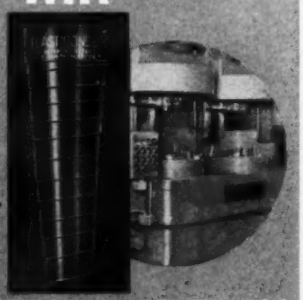
to lower production costs... improve product efficiency



ELASTICONE® PROTECTIVE COVERINGS

cover-up vital exposed shafts and bushings!

Versatile Elasticones snap over all types of exposed shafts, bushings, pins and screws, guarding them against damage, reducing breakage, lubrication problems and shutdown time.

Elasticones are spirally wound cones of flat steel, formed in all sizes to meet all requirements. They're low-costing, easy to install. *Write for complete data including new Bulletin '57.*

CENTRAL Safety Equipment Co.
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Most Drilling Per Dollar!

Features Found Only In Highest Priced Radials

- Finger-Tip Clutching
- Automatic Drill Ejector
- Push Button Elevation
- Centralized Controls
- Hardened Column & Way Inserts
- Automatic Depth Control
- Timken Bearing Column & Spindle
- Head Glides on Ball Bearing Rollers

Refer to Sweet's Machine Tool File (IA)VE) for our catalog

Send for Brochure of **Veet's** 16 Points of superiority and name of nearest dealer, who will arrange actual demonstration of the **Veet** Radial in your plant, without obligation.

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You don't know **IMPORTANT** *things about Precision Internal Gaging until you know . . .* COMTORPLUG

These firms know:

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Douglas Aircraft
Fairchild Engine & Airplane Co.
Falk Corp.
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The full list reads like a "Who's Who" of U. S. Industry!

Unique expanding plug gage shows actual hole size, measures front or back taper, ovality, barrel shape, etc.

⅛" to 10" dia.

Why **IMPORTANT**...

With Comtorplug internal gage you need NO GET-READY program. NO TRAINING needed, NO COMPRESSED AIR LINES, ELECTRONIC GEAR, etc. You get positive AUTOMATIC 2-POINT GAGING within .0001". Shows EXACT hole size. FIXED, not passing, reading. Shows EXACT amount of front or back taper, ovality, barrel shape, etc. Here is truly PRECISION MADE EASY!

Get important facts, request Bulletin 50.

Comtor Co., 82 Farwell St., Waltham 54, Mass.

REQUEST BULLETIN 50

CIRCLE INFORM-A-GRAM KEY NO. 1094

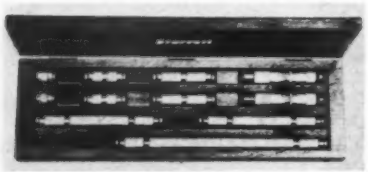
PRODUCTS on PARADE

For more information about the products described here, use POSTAGE-FREE Reader Service Card in this issue.

Solid Carbide Chucking Reamers have been introduced by The Atrax Co., Newington Conn. Series 1564-R have 21 tools ranging in diameter from 1/16" to 3/8". Features include

right hand spiral flute, straight shank, precision ground lands, radius chamfer, and right hand cutting. Reamers from 1/16" through 1/4" are 4 fluted and from 17/64" through 3/8" are 6 fluted. **Circle No. A1.**

Highly Accurate End Measuring Rods in sets are used with hob borers and other machine tools where spacings and table settings must be held to a high degree of precision. No.



244 Series rods are available from 1" to 15" sizes and in standard sets or in any combination of sizes to suit specific requirements. The L. S. Starrett Co., Athol, Mass., or — **Circle Inform-A-Gram No. A2.**

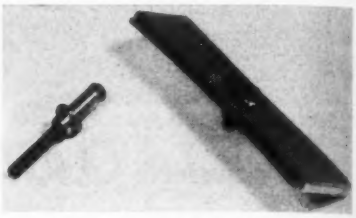
An Electric Etcher has 14 heats up to 1350 watts and permanently marks iron or steel. Model 4M offers convenient rotary switching, and

uses include production line or identification markings on tools, dies, nameplates, castings, etc. Martindale Electric Co., Hird Ave., Cleveland 7, or — **Circle No. A3.**

A Digital Index Table can be pushbutton or numerically controlled and is accurate to seconds of arc. Versatility is provided by the digital electronic control of a mechanical index mechanism that permits infinite resolution from 1 to 21,600 division of a circle. 18", 24", 36", and 45" dia units are available. Modern Engineering Service Co., 1695 12 Mile Rd., Berkley, Mich., or — **Circle Inform-A-Gram No. A4.**

An Unprecedented Degree of Flexibility of machine selection is permitted by one of the design features of the new Sundstrand "C" Model Rigidmil. This is possible because the unit construction of head, table, and column permits these basic elements to be interchanged through several machine sizes. These milling machines are available with table widths from 14" to 38", table strokes from 3' to 14', and either pushbutton or automatic control. Sundstrand Machine Tool Co., Rockford, Ill., or — **Circle Inform-A-Gram No. A5.**

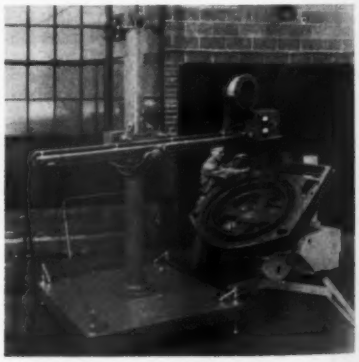
Use Daisy Blind Rivets for light sheet metal applications. Fabricated of steel for high-strength, the rivets have wide spread gripping leaves, formed from the split sleeve



when the fastener is installed, making hole size a non-critical assembly design consideration, when used. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, or — **Circle Inform-A-Gram No. A6.**

Holes in Templates are readily located and drilled to within 0.002" with a coordinator machine. It can also produce drill jigs, simple fixtures, and other precision work in flat sheet metal or plate. Holes from 1/16" to 3/8" dia can be located and drilled. Wiedemann Machine Co., 727 Wissahickon Ave., Philadelphia 32, or — **Circle No. A7.**

Position and Pilot Standard Automatic Welding Heads with extreme accuracy with the Bantam series of automatic welding head manipulators. They are recommended for shops requiring versatile equipment



for medium-sized fabrications, small production runs, or special jobs. Features include 360° rotation of boom, infinitely variable welding speeds up to 87 ipm. The Lewis Welding & Engineering Corp., Welding Div'n, 53 Interstate St., Bedford, Ohio, or — **Circle Inform-A-Gram No. A8.**

Costs up to 35% less to buy than other lightweight tooling metals

Here's why Dow magnesium tooling plate costs less to buy. The fundamental characteristics of magnesium permit rolling and oven thermal flattening to a degree of flatness and surface smoothness satisfactory for virtually all tooling uses. This flatness is not obtainable in other lightweight tooling materials without costly machining of the surface.

You save on fabrication costs, too. Magnesium's unsurpassed machinability saves time, effort and wear. Magnesium's lightness makes tools easier to handle during fabrication and use. Remember—magnesium COSTS LESS TO BUY, COSTS LESS TO FABRICATE, COSTS LESS TO USE!

Ask your Dow magnesium supplier for the complete story. Contact him today or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 1427B.

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A. R. Purdy Co., Inc., Lyndhurst, New Jersey
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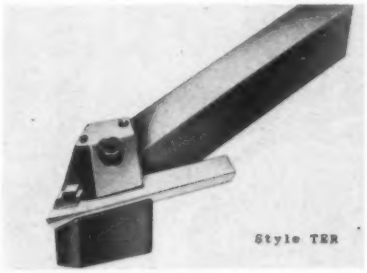
Reliance Magnesium Company, Los Angeles, California
Vinson Steel and Aluminum Company, Dallas, Texas

YOU CAN DEPEND ON DOW

CIRCLE INFORM-A-GRAM KEY NO. 111

Engine Lathe Work in Tool Room or Production line is the purpose for which this carbide tool holder was designed. It affords positive rake, positive center, and positive chip



control. The tool permits greater depths of cut with decreased tool pressures and provides up to 30% horsepower reduction over negative rake tools. Everede Tool Co., 2000 N. Parkside Ave., Chicago 39, or — **Circle Inform-A-Gram No. A9.**

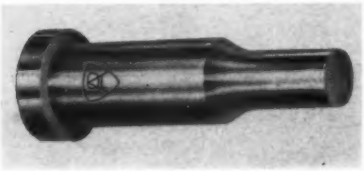
Use Mighty-Midget Portable Drill on tool setup work, dies, jigs, and fixtures, special machinery, etc., which are hard to reach with larger

drills. The 200, 300, and 400 series will drill up to ⅜" and tap 5/16" holes with high accuracy. Portomag, Inc., 1511 E. Nine Mile Rd., Ferndale 20, Mich., or — **Circle Inform-A-Gram No. A10.**

A Synthetic Duo-Face Seal is supplied pressed onto the Timken bearing cone. This seal combines the features of the outside diameter seal and the face type seal. The seal

eliminates the handling and assembly problems related to conventional seals. It is now available on seven sizes of bearings. The Timken Roller Bearing Co., Canton 6, Ohio. **Circle Inform-A-Gram No. A11.**

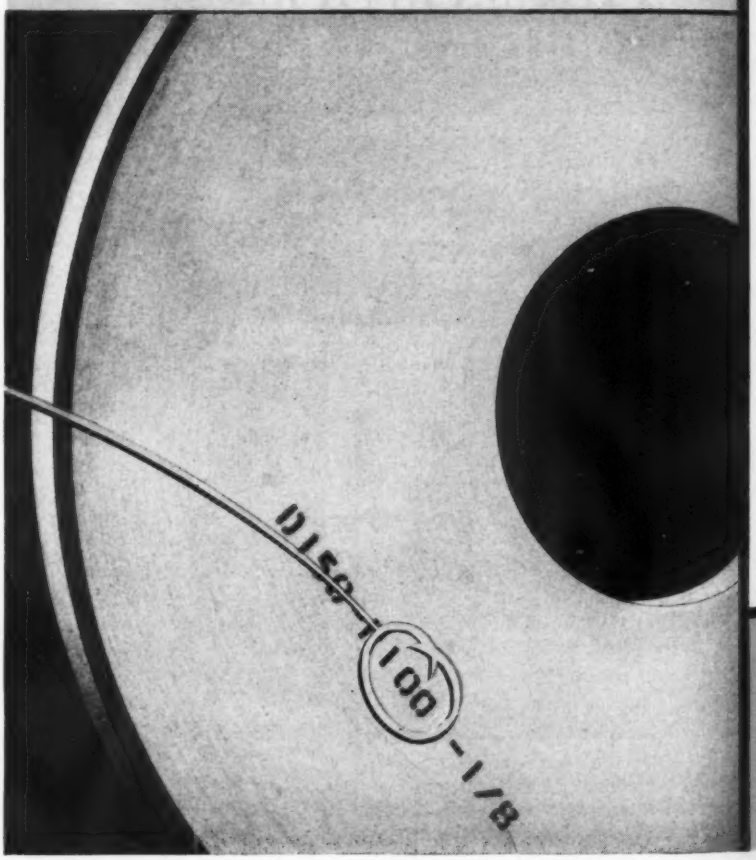
A Shoulder Punch Line has been introduced by Richard Brothers Punch Div'n, Allied Products Corp., 26500 Capitol Ave., Detroit 39. Series AP shoulder punches with round points are of vanadium type tool steel and carried in stock. Special punches having points of any shape or size can be made to customer



specifications. When unusually tough steels are to be pierced, shoulder punches of special alloys can be furnished. **Circle No. A12.**

Wrought Aluminum Tooling Plate in a wide range of sizes comes in two classifications — Nos. 1 and 2 tooling plate. No. 2 is machined on both sides to a fine finish of approximately 32 micro-inch. No. 1 tooling plate is offered with an "as rolled" finish. It is recommended for applications with less exacting finish and flatness requirements. Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11. **Circle A13.**

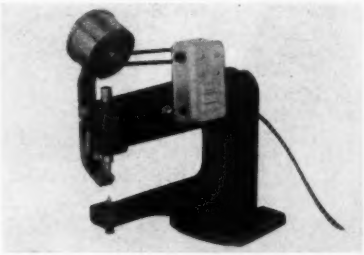
ON NORTON DIAMOND WHEELS
...THIS MARK IS
Your CERTIFIED Buying Guide



Drill Various Types of Non-Metallic and non-ferrous materials with a line of carbide tipped and solid carbide twist drills. Carbide drills can also be used in many cast iron applications and on some steels where

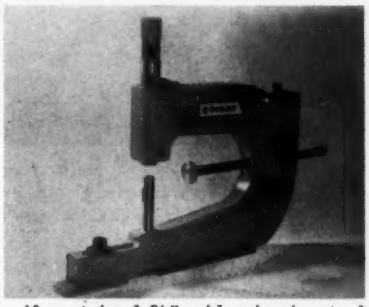
chip forming conditions are satisfactory. In brittle and abrasive materials these carbide drills will permit higher cutting speeds. National Twist Drill & Tool Co., Rochester, Mich., or — **Circle No. A14.**

An Eyeletting Machine has an electric feed that is ideal for fabricating, fastening, and assembly work. It handles printed electronic and electrical circuits as well as components and small units. The ETCO



AE-100 is foot operated but has a belt driven agitator which automatically feeds eyelets from slots to work position. Eyelet Tool Co., Inc., 236A Broadway, Cambridge, Mass., or—**Circle Inform-A-Gram No. A15.**

A Punching Unit for use in press brakes, punch presses, and arbor presses is capable of piercing from 0.093 to 0.3115 dia holes in up to ⅛" thick mild steel. This self-aligned,

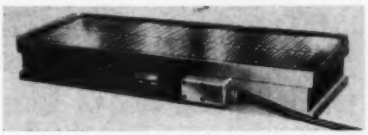


self-contained ¾" wide piercing tool is available with either a 6¼" or 7½" shut height and has a 3½" die height. Toolset, Inc., 1411 Military Rd., Buffalo 17, N. Y., or — **Circle Inform-A-Gram No. A16.**

Lock Washers of the non-interlocking spring type can now be oriented through an escapement track direct to a desired application. With this development, the feeding rate is in excess of 15,000 pcs/hour.

Lock washer sizes from ⅛" to ⅞" have been successfully hopper fed. Perry Equipment & Engineering Co., Div'n of Automation Devices, Inc., 3125 Brandes St., Erie, Pa., or — **Circle Inform-A-Gram No. A17.**

A Fine-Grid Magnetic Chuck features precision-meshed magnetic poles which are 37% closer together than in similar types. The resulting powerful magnetic pull holds even small parts firmly in place while



being machined. They can be installed in tandem mounting or end to end to make up larger machine table surfaces. Hanchett Magna-Lock Corp., 584 Maple St., Big Rapids, Mich., or — **Circle No. A18.**

On this Norton diamond wheel we have highlighted the mark indicating diamond concentration — in this case, 100.

What is the exact meaning of the Norton 100 mark?

It means that each Norton 100 concentration diamond wheel contains an amount of diamond in carats calculated to a formula of 72 carats per cubic inch. Wheels of 75, 50 and 25 concentration of diamond contain 75%, 50% and 25% of this 100 concentration standard, respectively.

The finished wheel contains the calculated number of carats of diamond except for the slight loss resulting from truing the diamond section to place the wheel in proper truth and condition for grinding.

With each wheel you get a certificate assuring the complete dependability of its concentration mark, signed by the President of this Company.

The Norton certified mark is your safest possible buying guide. It assures the top performance and long wheel life that you're paying for.

And remember:

Besides duplicating wheel specifications with constantly controlled accuracy, Norton was first to introduce all three types of diamond wheels — metal, resinoid and vitrified bonded . . . does all its own sizing, grading and laboratory checking of diamond bort . . . brings you a complete line, covering every diamond wheel application . . . gives you fast service from full stocks.

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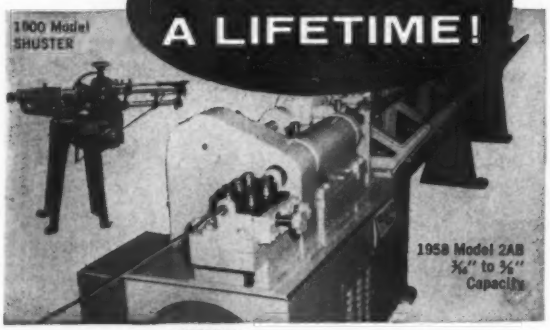
THEY LAST A LIFETIME!



SHUSTER — the oldest name in wire straightening and cutting — makes machines that consistently pay their keep over and over again. Many fifty and sixty year old Shusters are still working a full shift every working day! And today's Shusters give the same full value — send us your specs for wire from .020" to 11/16" — and we'll prove that a Shuster pays for itself faster than any comparable machine — and it pays *you*, over a lifetime of profitable use.

METTLER MACHINE TOOL, Inc.

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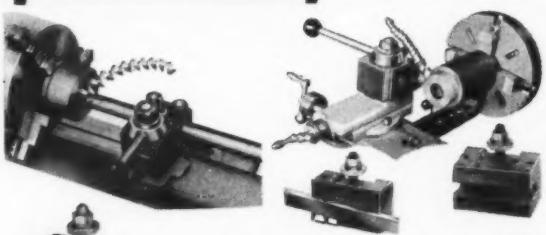
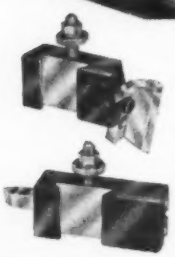
WITH ALORIS QUICK CHANGE TOOL POSTS & TOOL HOLDERS





Change tools instantly — for turning, facing, drilling, boring, threading, knurling, cutting off or any operation.

- Maximum Repetitive Accuracy Assured
- No Shims . . . No Time Wasted
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- Leading Lathe Mfrs. Recommend It
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NEW! Aloris Holder for Carbide Triangular Inserts.

Greater rigidity, versatility, efficiency & economy

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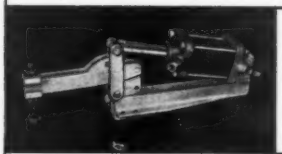
KNU-VISE has come up with it!



TWO NEW AIR-OPERATED CLAMPS with 800 pound clamping force

AO-800 CLAMP

AODT-800 DOUBLE TOGGLE CLAMP

Because you asked for it, Lapeer's vast line of Knu-Vise clamps now features four distinct groups of air-operated clamps. Two new 800 lb. air clamps have been added to the widely accepted 200, 400 and 1200 lb. air clamps, thereby rounding out the Knu-Vise series. The Model AO-800 clamp is for conventional holding operations—the Model AODT-800 for those difficult mounting situations.

For complete information on these units and the more than 150 other models available, write for catalog today!

Manufacturers of over 150 models of manually and air-operated clamps and pliers

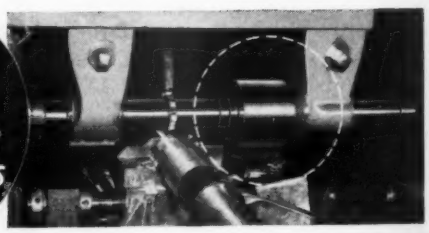
KNU-VISE PRODUCTS LAPEER MANUFACTURING CO.

3064 DAVISON ROAD • LAPEER, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1143

ELIMINATE MILLING MACHINE MAINTENANCE

OF ARBOR OUTER SUPPORT BUSHINGS



OFTEN UPS SPEEDS AND FEEDS 200%

Sound too good to be true? Then see how General Electric, Jeffrey Mfg., hundreds of others absolutely end arbor bushing maintenance problems and decrease production costs on horizontal milling machines by replacing the bronze outer support bushing with a Jergens "Live" Sealed Roller Bearing Unit as illustrated above. Jergens Units with adjustable roller bearings hold precision—permit increases in milling speeds and feeds to take full advantage of carbide cutters. The rigidity of these units increase cutter life and eliminate chatter, frozen bushings, and twisted arbors.

SEE HOW HUNDREDS SAVE THOUSANDS!

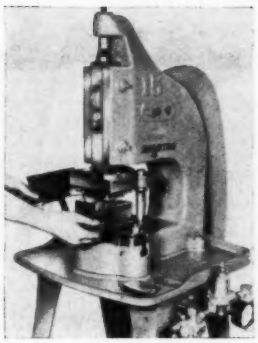
WRITE FOR FREE CASE HISTORIES OF ACTUAL company performance reports of jobs and dollars saved!

DONLEY PRODUCTS, INC.

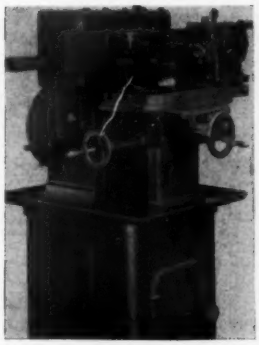
Dept. TP-2, 11106 Avon Ave. • Cleveland 5, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1144

A Metal Tag Producing Press is a combination of a standard foot-press with a combination embossing, punching, blanking, and flattening assembly in die-set. A foot control valve operates the press, and a guard is provided if scrap material is used for tags, necessitating close hand feeding. The Acromark Co., 439 Morrell St., Elizabeth 4, or —
Circle No. A19.



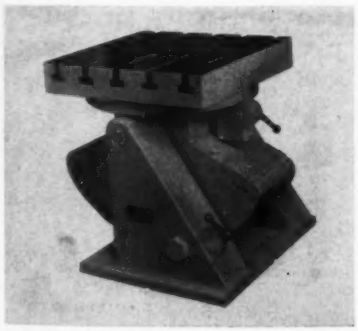
A Shaper makes irregular shaped stamping and electrode punches of high precision, ±0.00025". Model K-150 has a larger dividing head with automatic circular feed which permits machining of radii and angles automatically. No further machining is necessary. Jersey Mfg. Co., 461 Livingston St., Elizabeth 1, N. J., or —
Circle No. A22.



Level Machine Tools, electronic racks, benches, etc. with a large-diameter swivel pad. The pad swivels 10° each side of the centerline and adjusts automatically to unevenness in the floor surface. The

tapped hole permits vertical adjustment of the 1⅞" pad for leveling purposes. Vlier Engineering, Inc., 8900 Santa Monica Blvd., Los Angeles 46, or —
Circle Inform-A-Gram No. A20.

A Heavy-Duty Worktable for radial drilling, tapping, and boring incorporates the means for both angular and radial positioning of workpieces. It provides 360° rotation and eight equally spaced radial



locating holes. The cradle-type design permits tilting work in a number of different planes from horizontal to vertical. The standard table is 20" square x 3" thick. Galger Engineering and Mfg. Co., 3802 S. Main St., Rockford, Ill., or —
Circle Inform-A-Gram No. A21.

2548

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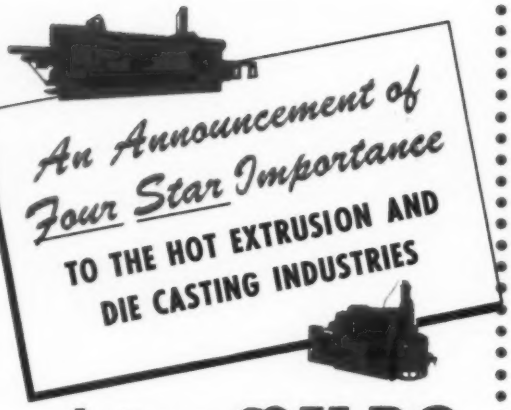

4 New MILNE Hot Work Steels

The announcement of these new Milne steels marks the most significant advance in hot die metallurgy of the past decade. These new Milne steels have unprecedented physical advantages enabling them to take thermal and mechanical punishment no other hot work steels can stand.

For major producers of hot extrusions and die castings these steels can provide "custom-tailored" routes to better tooling.

Your nearest Milne representative will be glad to give you further details, *in person*, without obligation.

Milne's new Hot Work steels are available in Rounds, Flats, Squares and in forged Blocks, Discs and Rings.

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SALES OFFICES: Rochester, N. Y. • Indianapolis • Louisville • Milwaukee • Kansas City, Mo. • Charlotte, N. C. • Phoenix, Ariz.

SALES AGENCIES: Maxwell Steel Co., Inc., Fort Worth, Texas • Sanderson-Newbould Ltd. (in Canada) Montreal-Toronto

Also wide range of grades and sizes in

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AM-39A

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330

A new general purpose Hot Work Steel—highly resistant to thermal shock and heat checking—has good physicals and hardness at elevated temperatures. Distinctly insensitive to water cooling. For **all types of extrusion on soft and cuprous metals. For aluminum, zinc and magnesium die casting dies.** It is weldable.

331

An adaptation of AM 330 steel with increased carbon to provide the higher strength required by applications such as **hot extrusion dies for aluminum, magnesium etc.**

333

A steel with exceptional capacity for dissipating heat. The last word for **brass die casting** and for all hot work applications where rapid heat removal is vital in hard-to-cool parts.

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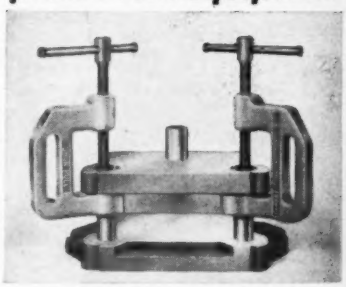

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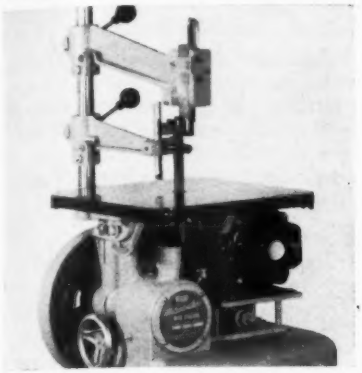
Infinitely Variable Speed and Stroke Lengths are two of the features of the die filer, an addition to a line of die making equipment. Through simple adjustment of two



controls, speed may be varied from 100 to 475 strokes/min and stroke length from 0 to 2". There is a choice of three sizes or 4-way tilting tables. Rice Pump & Machine Co., Belgium, Wis., or — **Circle No. A23.**

Hold Very Thin and Narrow Pieces with ease and accuracy with master V-block angle plates. Tapped holes, tee slot, and bolt slot in the angle

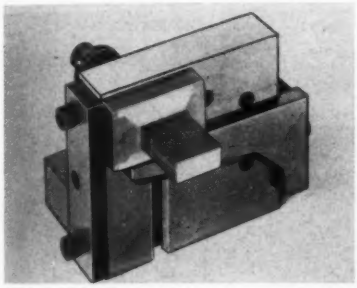
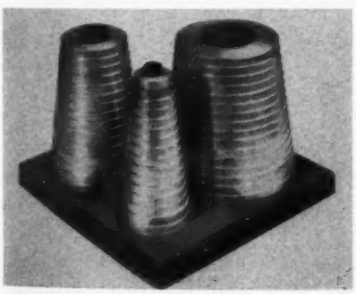


plate provide easy means of clamping for every job. The V capacity is ⅛" to 2¼". Lassy Tool Co., Plainville, Conn., or — **Circle No. A24.**

Bore Soft Chuck Jaws to size using the 48-piece truing ring set. Mounted on a handy peg-board, the complete set of rings includes sizes from 1" to 4" OD in 1/16" increments. Save time



when locating or machining the proper sizes of stock with the rings. Rockford Engineered Products Co., 2324 23rd Ave., Rockford, Ill., or — **Circle Inform-A-Gram No. A25.**

Index 2000 Lbs on a 26" Dia Dial Index Table which may be equipped with as many as 12 stations. Model 26 will automate drilling, tapping, riveting spinning, staking, knurling,

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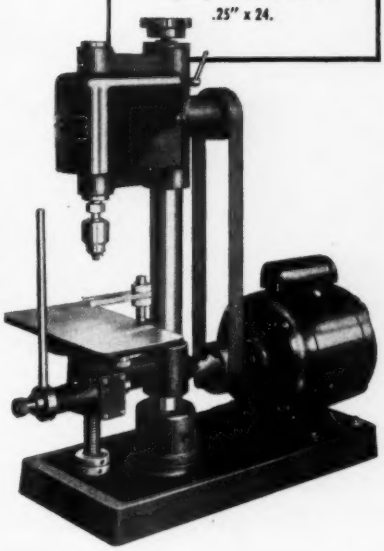
Hamilton Super Sensitive, Small-Hole, Precision Tapping Machine.
Capacity — .034" x 120 to .25" x 24.



Recent design change provides a simple homing device as a standard component of the

HAMILTON SUPER SENSITIVE, SMALL-HOLE PRECISION TAPPING MACHINE

and makes routine of such problem work as the tapping of precision holes in thin metal sheets or in brittle plastics. Even improves performance in the tapping of blind holes!

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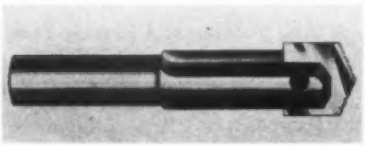
Speed Production of Holes in Heat-Treated Alloy Steels, stainless steel, titanium, and other types of hard-to-machine metals and castings with Clark spade drills. The replaceable

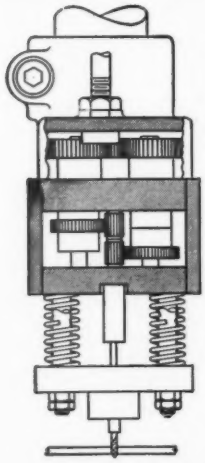


spade-type drill blades are made of high-speed steel which increases production 5 to 8 times. Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif.—**Circle No. A28.**

Diamond Mounted Points and Hones are now included in the products from Abrasives Div'n, Elgin National Watch Co., Elgin, Ill. The

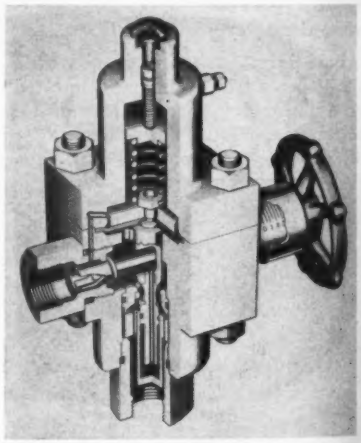
mounted points come in sizes ranging from 3/32" to 1" dia; the hones in standard sizes, with specials available. Points are mounted on solid carbide shanks to provide maximum tool rigidity for greater grinding accuracy. — **Circle No. A29.**

Eliminate Close Center Drilling problems with a multiple drill head attachment and an automatic index table. The units can produce any type of part pattern of holes on a close center. They drill linear, oval,



circular, zig-zag, or more complex and irregular arrangements. The drill head attaches easily to a drill press, spindle, or other power unit and requires only one source of power. ConRay Corp., 29 W. Apple St., Dayton, O., or — **Circle No. A30.**

A Forged Steel Body for heavy-duty service is a feature of the constant flow control valve. It is a "V" type characterized valve that insures positive control over low rates of



flow and a Stellite faced inlet valve with Stellite seat. Working pressure is 5,000 lbs and flow rate is 45 gpm. Kobe, Inc., 3040 E. Slauson Ave., Huntington Park, Calif.
Circle Inform-A-Gram No. A31.

Illustrated—Logan Model 400 RFL Unit

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Logan RFL Unit, the designers choice for over a decade! Protects your air-powered equipment . . . regulates pressure . . . filters air . . . lubricates air. Adds years of dependable performance.

New Model 400, illustrated above, is a companion model to the well-known Model 600.

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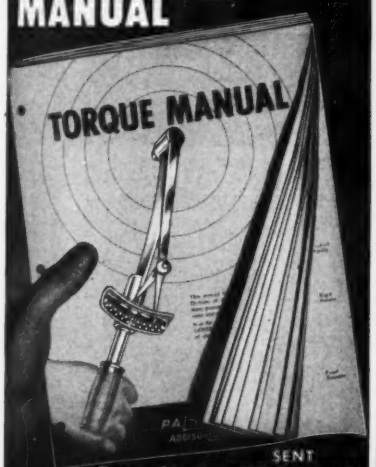

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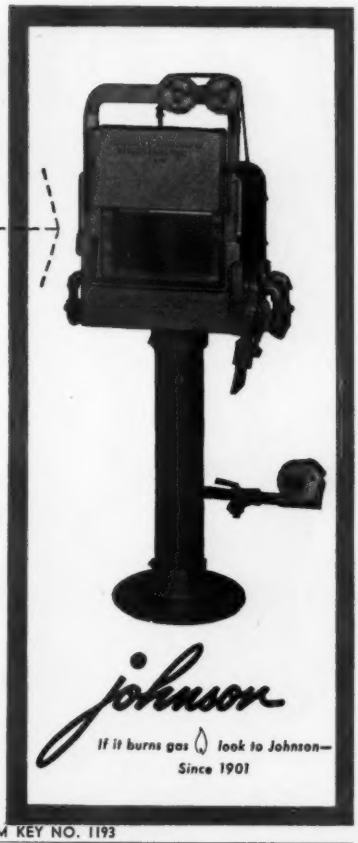

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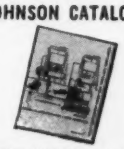

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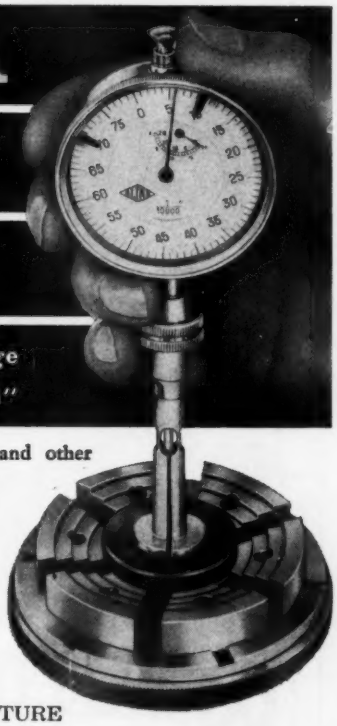
ALINA BORE TEST



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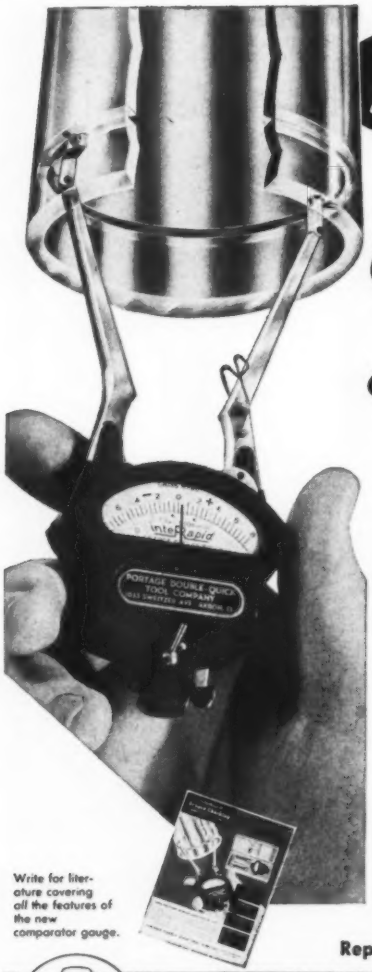

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- ★ Quick setting adjustment knob sets scale reading from gage blocks, mikes or ring gauge.
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- ★ Retracting lever allows in and out movement of measuring arms while positioning instrument
- ★ Easily read large meter-type face is graduated in .0005".
- ★ Interchangeable tips offer versatility in application

The new P.D.Q. groove checking comparator gauge offers guaranteed Swiss accuracy and workmanship.

Sets come complete with both short and long groove tips, special "flat bottom" tips, button tips, centering arms, spare screws, special socket wrench and screw driver, all in one compact, sturdy case. Units measure internal grooves from 3/8" to 6"

Write for literature covering all the features of the new comparator gauge.

Representatives in principal cities

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CIRCLE INFORM-A-GRAM KEY NO. 1201

Now Available... FOR YOUR CONVENIENCE

Miccro *Supreme Spray*

LAY-OUT DYE (Purple)

A new, easy-to-use, dependable, spray Lay-Out Dye for tool, die, pattern, or template layout on metal. Dries instantly—shows up in sharp relief.

Also Still Available...

Miccro *Supreme*

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For layout on metal and quick identification of bar stock, sheets, strips, or parts. Also dries instantly and shows up in sharp relief. Available in brush-in-cap cans and larger containers.

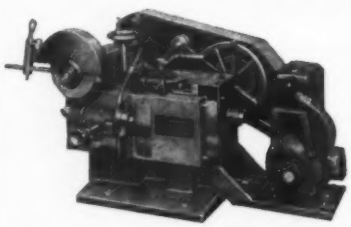
Write for circular on company letterhead.

MICHIGAN CHROME & CHEMICAL COMPANY

8615 Grinnell Ave. • Detroit 13, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1203

CUT MAINTENANCE COSTS WITH WARDWELL "35T" GRINDER



This money saving machine sharpens metal saws in gangs — as many as 150 saws .015" thick at one time, including slitting and screw slotting saws and milling cutters up to 5½" diameter. Completely automatic. Just start machine — it does the rest.

Save money and make money with a Wardwell 35 T Saw Grinder.

Write for Bulletin 35 T

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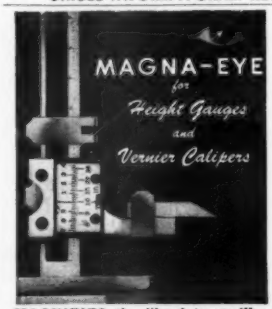


MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 5 No. 100 for 6" Vernier Calipers; 5 No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; 5 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.

For Complete Information Write, Phone or Wire

STEBAR COMPANY

215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1204

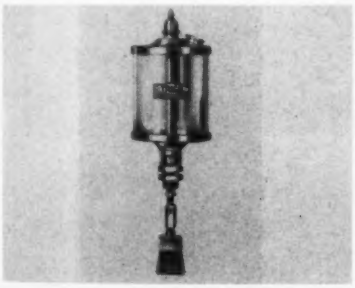
An Adjustable Compound offers precision holding and locating provision for spindles and workpieces. Constructed of cast aluminum so it is light and easy to handle. The compound is specifically designed for a

wide range of adjustments, and can be mounted and used on any surface in any position. Tracer Control Co., 595 E. Ten Mile Rd., Hazel Park, Mich., or — **Circle No. A32.**

A Cast Alloy Tool Bit of Hardsteel HD-27M has been announced by Black Drill Co., 1400 E. 222 St., Cleveland 17. Cutting tools made of the Hardsteel will take deeper cuts at higher speeds with heavier feeds, and remove more metal/hr with less cratering. The tool bits are available in square and rectangular standard sizes and are recommended for turning, facing, boring, grooving, and forming many types of nonferrous materials.

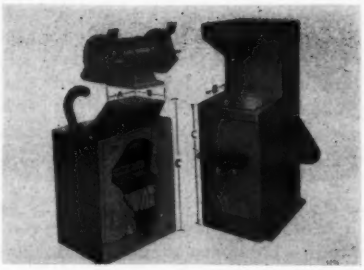
Circle Inform-A-Gram No. A33.

Automatically Apply a Film of Oil to chains, gears, slides or irregular surfaces with an oiler. Oilers can be mounted at any convenient location and oil is released by gravity



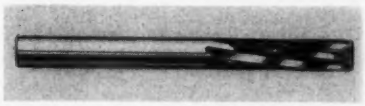
from the reservoir either manually or electrically to oil applicators. The specially designed applicators can withstand temperatures up to 275°F. Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, or — **Circle No. A34.**

Instantly Convert Existing Grinders into a combination arrangement with the Grind-Air-rester conversion unit. At the left is a combination pedestal-cabinet to serve 7", 8", and 10" grinders. The unit at the right



has a capacity for two 12" or two 14" grinding wheels. The Standard Electrical Tool Co., 2488 River Rd., Cincinnati 4, or — **Circle No. A35.**

A Standard Length Solid Carbide Chucking Reamer with steel shank features right and left hand spiral flutes. Series 1565-R also features straight shank for full chucking,



brazed solid carbide cutting tip, radius chamfer, and right hand cutting. They are available in ⅛" to ¾" dia and overall length from 3½" to 9½". The Atrax Co., 240 Day St., Newington, Conn., or — **Circle A36.**

Fairfield Manufacturing*

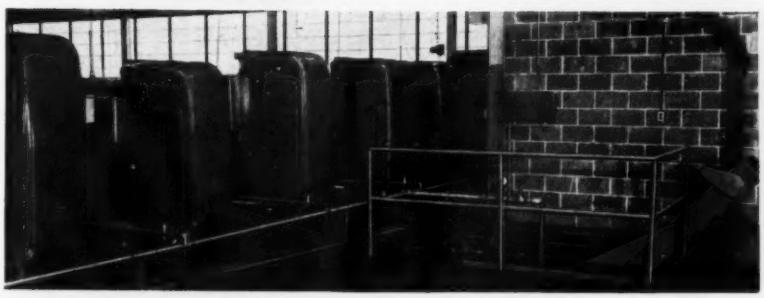
*LAFAYETTE, INDIANA

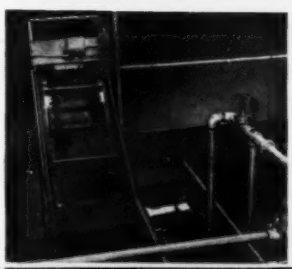
Improves Gear Finish, Reduces Costs with the

Delpark

Filter-Matic

VACUUM FILTER





The heavy viscosity of cutting oils has always created problems where filtration was required on high flow rates. The fluidity of the oil itself often defeated the method, but on gear shaving production the metal fines borne in the spent oil added even greater difficulties.

Delpark's Filter-Matic Central System at Fairfield serves 10 Gear Shavers with a combined flow requirement of 30 g.p.m. To allow for future addition and expansion, a 60 g.p.m. Filter-Matic was installed.

Fairfield has benefited several ways through the Delpark Filter. Gear finish has been improved, machine productivity has been increased and maintenance time reduced.

The Delpark Filter-Matic can save you time and money in filtering soluble and cutting oil on your machining operations. A Delpark representative can give you the complete story.

Delpark

—First in Filtration Advancement

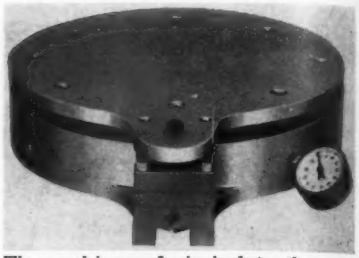
INDUSTRIAL FILTRATION COMPANY
65 INDUSTRIAL AVENUE
LEBANON, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 121

Increase Production up to a Possible 140% using the "Curtain of Light" press guard. This projector

throws a broad beam of light (up to 18" high) across the danger area of the press. The press is automatically stopped if the light curtain is broken at any place. 7", 13", and 18" models are available. Electronic Control Corp., 1573 E. Forest Ave., Detroit 7, or—**Circle Inform-A-Gram No. A37.**

A Machine-Mounting System, Air-Mount, supports a machine on columns of air with no rigid connection between it and the floor. Pressure gage readings indicate machine weight supported by each unit under each support point of the machine.

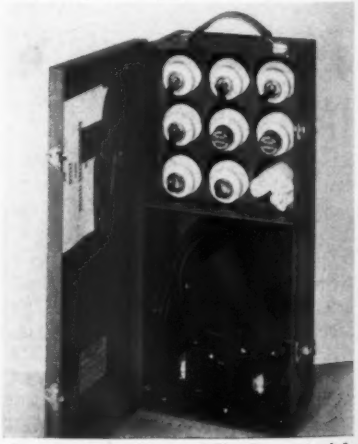


The cushions of air isolate the machine from outside vibration and minimize those which develop within the machine itself. Weber Instrument Co., 11301 Schaefer Rd., Detroit 27, or — **Circle No. A38.**

Annealing, Brazing, Soldering, Tempering, stress relieving, shrink fitting, etc., can be performed by a high frequency induction heating machine. The Inductron has approximately 1000 kc which provide ex-

tremely rapid heating and high production rates and allow the machines to be incorporated directly into production lines. The Cincinnati Milling Machine Co., Cincinnati 9, or — **Circle Inform-A-Gram No. A39.**

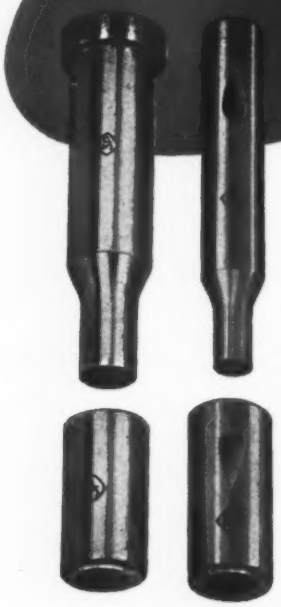
Locate Cracks, Pores, leaks, and other defects open to the surface in any solid material with a portable Flourescent Penetrant inspection kit. This kit, the Zyglo ZA-43, contains



the most sensitive of Zyglo materials in pushbutton, pressurized spray cans. Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, or — **Circle Inform-A-Gram No. A40.**

If your feeling the PINCH...

For want of a PUNCH...



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ENGINEERING DRAWINGS • COST SAVING DATA
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The **HEIMANN** *MAGNETIC* **CHIP REMOVER**

THIS HAND IS IN THE CHIPS! Yes, and the chips are *not* in your eyes or hair or ways of machines. The Heimann Magnetic Chip Remover gets chips out of blind holes rapidly, cleanly, safely. It's a lastingly efficient permanent magnet in a knurled aluminum holder. Send it in after chips and it comes out covered with them.

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HEIMANN MFG. CO., URBANA, OHIO

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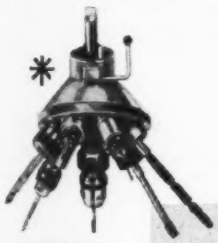

DRILLS *from 2 to 7 holes*
TAPS *from 2 to 7 different sizes in one chucking*

JEMCO'S ARBO-2 fits any single spindle vertical drill press

all operations completed with one chucking — no reversing of drill spindle necessary for tapping — speeds changed quickly — reduces machining time-tapping capacity 1/8 to 9/16-drilling capacity 0 to 19/32

ARBO-2
automatic indexing turret type multi-spindle drill head

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Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.

A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

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A Severance CARBIDE ECONO-SINK WILL GIVE YOU —
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MORE PRODUCTION
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SMOOTHER SEATS
AND A COMPLIMENT FROM THE BOSS FOR SUGGESTING THE CHANGE
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WITH THE NEW Severance CARBIDE ECONO-SINK YOU GAIN ALL THE ADVANTAGES OF CARBIDE TOOLING - AND AT LESS COST per Countersunk Hole
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SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

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No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

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ECONOMY ELEVATING TABLE

- DIE HANDLER
- CONSTANT HEIGHT TABLE
- LOAD LEVELER
- PORTABLE WORK TABLE

Dimensions.....24" x 36" Lift.....24" min. to 42" max.

Capacity .....2000 lbs. Price: F.O.B. Chicago $245.00

Free 10 day trial in your plant with return privilege

Positive Performance

Self-locking Acme screws hold load safely, securely, at any height. Roller bearing wheels.

Compact Design

No projecting parts — all four sides accessible; crank studs at both ends; three table surfaces.

ECONOMY ENGINEERING 4509 W. Lake St. Chicago 24, Illinois

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- ★ Drop Forged Wrenches
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- ★ Chain Tongs

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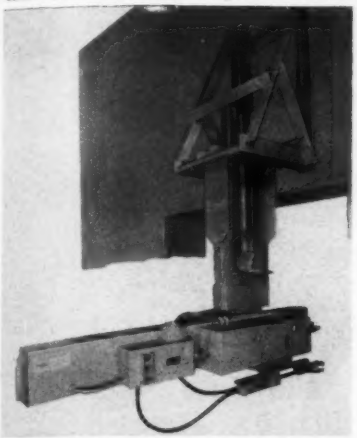
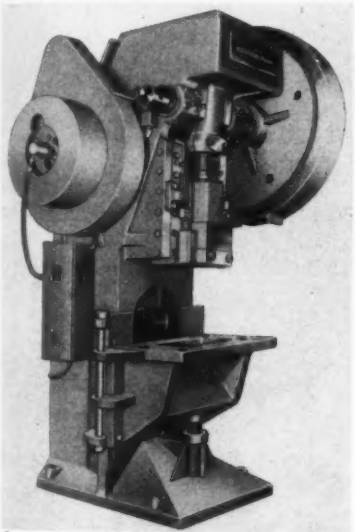
CIRCLE INFORM-A-GRAM KEY NO. 1244

An Overhead Arm Unit is used for unloading stampings from presses in a straight line. Different unloaders and jaw assemblies can be used with the vertical slide adjustment for



various jobs. This unloader has up to 42" total vertical travel adjustment. Press Automation Systems, Inc., 25418 Ryan Rd., Centerline, Mich., or —
Circle Inform-A-Gram No. A41.

A 60-Ton Horn Press is offered in both fly-wheel and single back geared models. The H-60 features a table to slide with standard 4" stroke

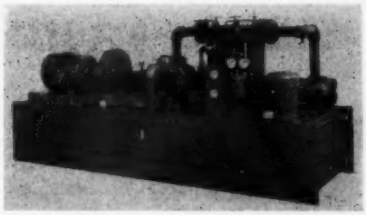


down and adjustment up is 9" with a maximum on special order up to 33". Crankshaft strokes up to 12" also. Johnson Machine & Press Corp., 620 W. Indiana Ave., Elkhart, Ind., or —
Circle Inform-A-Gram No. A42.

Faster Reaming, smoother finish, and longer tool life are possible with the new spiral fluted chucking reamers recently introduced by Fastcut Tool Co., 7405 E. Davison Ave., Detroit 12. The left hand spiral, right hand cut forces chips ahead of the reamer, keeping it free of chips.

Longer tool life and faster reaming is possible because the spiral flutes, being free of chips, readily allow the coolant to reach the cutting edges.
Circle Inform-A-Gram No. A43.

A Coolant Lubricant Package provides a constant flow of oil to a Dynamatic press drive, and is for use on metal stamping type of presses.



A separate lubricating system, mounted on the same reservoir, provides positive lubrication to the clutch bearings. Reservoir capacity is 150 gal, and a flow rate 50 gpm. J. N. Fauver Co., Inc., 51 W. Hancock, Detroit 1, or —**Circle No. A44.**

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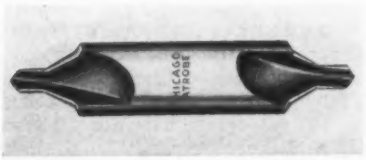
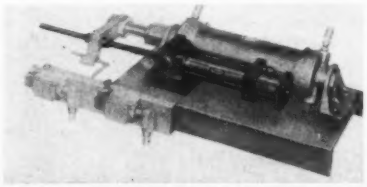
Produce a Drilled Hole and Countersink all in one operation. A tool is designed with spiral flute and in both plain and bell type points. Included angle of plain type is 60° and the bell type is 120°. Diameter of the drill portion equals length of the drill and the tool available in sets and in size diameter from 3/64" through ¼". Chicago Latrobe, 411 W. Ontario St., Chicago 10, or — **Circle Inform-A-Gram No. A45.**

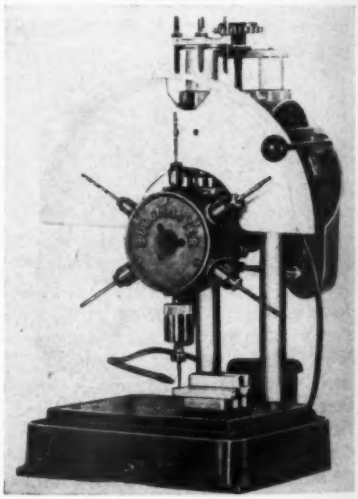


Smooth Cut Stroke Variations under irregular loads on air cylinders with a line of hydraulic checking cylinders. Maximum checking capacity is 2,000 lbs on the out stroke, with free return. Models are available with 2" to 8" checking stroke lengths. Speed control is dial-set, and is load compensated to assure uniform feed under changing loads. Modernair Corp., 400 Preda St., San Leandro, Calif.
Circle Inform-A-Gram No. A46.



A Two-Die Type Horizontal Cylindrical Die Thread Rolling Machine is announced. Model B 111 is well suited for high production and job shops and for both in-feed and thru-feed thread and form rolling on large and small production runs. Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass., or —
Circle Inform-A-Gram No. A47.

Machine Small, Delicate Parts that require extreme accuracy with a 5/16" capacity bench model turret drill. Drilling, tapping, reaming, counterboring, etc., can also be performed. A two-step timing belt drive provides 12 speed ranges. Burgmaster Corp., Small Tool Div'n, Burg Tool Mfg. Co., Gardena, Calif., or —
Circle Inform-A-Gram No. A48.

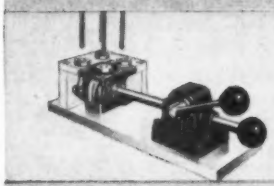


heinrich Grip Master
VISES
with exclusive "CIRCLE-GRIP" LOCKING MECHANISM
The fastest—safest—most accurate line of screwless type holding devices ever offered to industry.

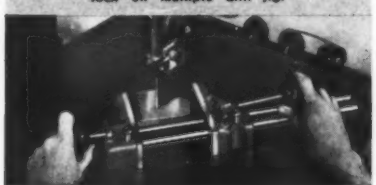
The Grip Master drill jig, shown in the above illustration, cost a Heinrich customer $60.00. Original drill jig design was estimated at $250.00. This is just one example of how you too can cut tooling costs with the Heinrich jig and fixture formula.

Sets and Locks in a Flash!
Speedy loading and unloading cuts production costs.

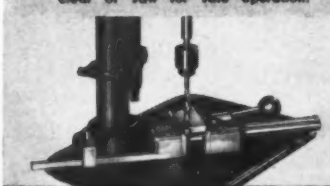
4 GREAT GRIP-MASTER WORK SAVERS


Heinrich Grip-Master Fixture lock on multiple drill jig.

The Grip-Master Fixture locks make jig and fixture designing easier—does away with locking details and troublesome clamps.


Tool steel cuts faster, safer when locked in the grip of a Heinrich band saw vise. Unlike other Heinrich Vises guide bar is of soft cold roll steel to prevent damage to saw blade—shoulder screws are removable for chain feed.
Heinrich Band Saw Vise leaves hands clear of saw for safe operation.

Heinrich Safety Drill Vise, with built-in recessed parallels, holds work square. Vertical V-groove provides positive grip on rounds—table mounting attachment does away with clamps, straps, and adapters. Vise cannot swing off table.


Heinrich Safety Drill Vise increases production with accuracy.

Write for free catalog—learn how Heinrich Grip-Masters can cut tooling costs.

HEINRICH TOOLS, INC., Dept. 138B, Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 126

C Punching holes in the work with the first stroke of press ram. No aligning of punches and dies. The same group of units may be used in unlimited set-ups for greater economies.

WRITE FOR FULLY-ILLUSTRATED CATALOG *TODAY*

PUNCH PRODUCTS *Corporation* 3804 HIGHLAND AVE., NIAGARA FALLS, N. Y.

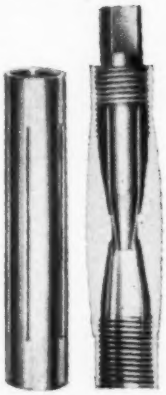
CIRCLE INFORM-A-GRAM KEY NO. 127

Flexolap.. INSTANTLY AND ACCURATELY

ADJUSTABLE FOR FAST LAPPING AND POLISHING

. . . without danger of galling or seizing!

The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15% — or more — under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.



Illustrated at left is Flexolap Set No. 1. Includes 6 complete laps, one of each size (3/16", 1/4", 5/16", 3/8", 7/16" and 1/2"), and one additional brass barrel of each size, all held on a sturdy, serviceable stand. Price complete $14.00

Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the Midget Lap. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps) $2.10

Write today for Catalog

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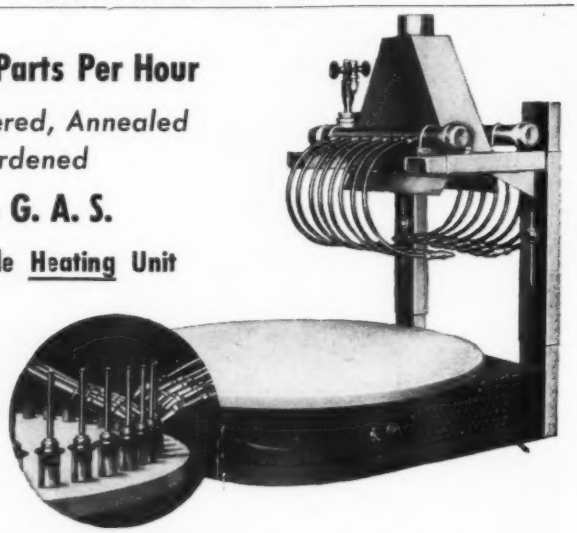
CIRCLE INFORM-A-GRAM KEY NO. 1281

Up to 1,000 Parts Per Hour

Brazed, Soldered, Annealed or Hardened

with the **G. A. S.**

Utility Turntable Heating Unit



Close-up of unit silver brazing a gasoline drain and feed pipe assembly at a production speed of 450 units per hour.

This high output, low cost unit will heat up to 1,000 parts per hour depending on the size and shape of the part. Then, when you are through with production on one part, in 5 minutes time the unit can be changed over to another — it is just that easy.

Simple fixtures on the transite hold the work. When changeover is required, the transite complete with fixtures, is easily removed and replaced by another complete setup.

The gas manifold with its 16 burners is quickly adjustable horizontally and vertically to suit different parts.

The turntable drive is variable to meet various heat requirements.

This is one of the many versatile, efficient production heating units built by G.A.S. and requires only a small initial investment. Learn how it will answer your production heating problems — write for Bulletin No. 512.

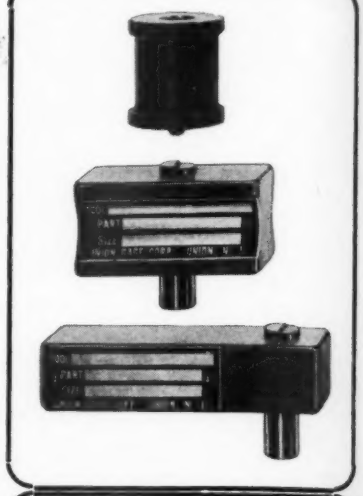
GAS APPLIANCE SERVICE, INC.

Industrial Gas Engineers

1936 West Balmoral Avenue Chicago 40, Illinois

REPRESENTATIVES IN MAJOR INDUSTRIAL AREAS

CIRCLE INFORM-A-GRAM KEY NO. 1282



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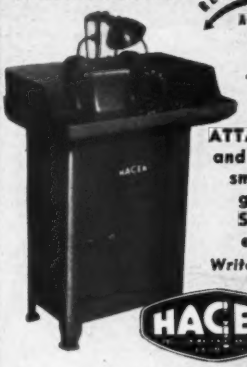
DID YOU KNOW? The Hager

UNIVERSAL CARBIDE GRINDER

with the Patented RECIPROCATING ACTION



. . . Has a **CHIP BREAKER ATTACHMENT** and table for small radius grinding as **STANDARD** equipment.

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Magnetic Base Indicator holders

Stainless holding rod set in ball socket
Precision adjustment like surface gage
Erick
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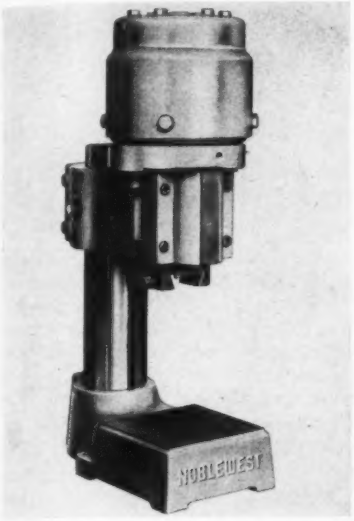
Model 2008
Only $6.50
See your dealer or write for catalogue 755 on the most complete line of magnetic base units & access. mfg'd.
Powerful 80 lb. pull base

CULLEN MFG. CO., RACINE, WIS.

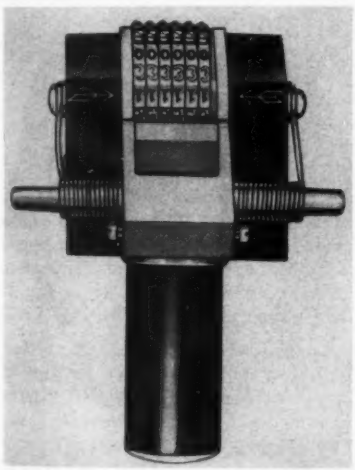
CIRCLE INFORM-A-GRAM KEY NO. 1285

A Light-Duty Bench Air Press is designed for marking operations, but is also applicable for light staking, dimpling, punching, bending, and related operations. Model 491 has a 1-



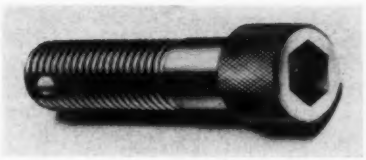
ton capacity and a ram stroke adjustable from 0 to 1". The Noble & Westbrook Mfg. Co., E. Hartford, Conn., or —
Circle Inform-A-Gram No. A49.

Wheels and Cams are built integrally in the numbering heads. Cams are milled directly on the wheel blanks, thus eliminating holes



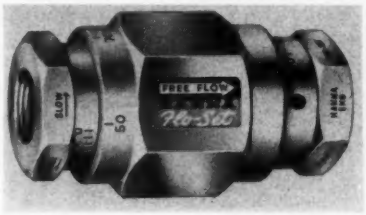
in both wheel and cam. Model 10 comes in 1/16", 3/32", 1/8", 5/32", and 3/16" sizes. George T. Schmidt, Inc., 4112 N. Ravenswood Ave., Chicago 13, or—**Circle Inform-A-Gram No. A50.**

Self-Locking Socket Head Cap Screws have been introduced in a complete range of sizes by The Cleveland Cap Screw Co., 4444 Lee Rd., Cleveland 28. The socket screws are made self-locking by a nylon pellet inserted in threaded section of the screws. Because they require no



lock washers, wired heads, or adhesives to keep them firmly in place, time and money are saved.
Circle Inform-A-Gram No. A51.

Control the Speed of Hydraulic Cylinders and other hydraulically operated devices with the Flo-Set 1000. When used with cylinders, these valves allow the instroke and outstroke speeds to be regulated separately. A set screw and locking collar locks the valve when the desired flow rate is established. Hanna Engineering Works, 1765 Elston Ave., Chicago 22, or — **Circle No. A52.**



Up to twice as much production per .001" of wear!

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Ex-Cell-O Bushings outperform competition.

An automotive manufacturer put Ex-Cell-O Bushings up against two other leading brands in a practical on-the-job test. Result: Ex-Cell-O out-produced brand A by 1210 pieces, brand B by 345 pieces! Average number of parts produced during .001" wear:

Brand A...1,045 pieces
Brand B...1,910 pieces
Ex-Cell-O..2,255 pieces

Try Ex-Cell-O Bushings and see for yourself.

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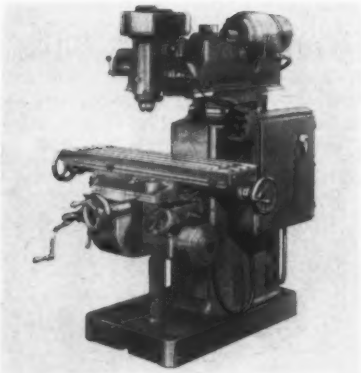
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

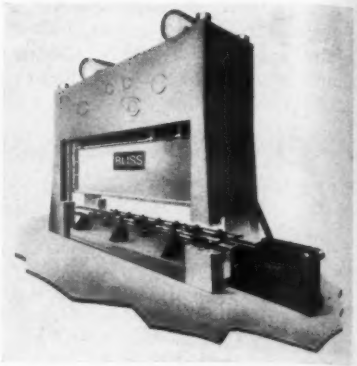
MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 129



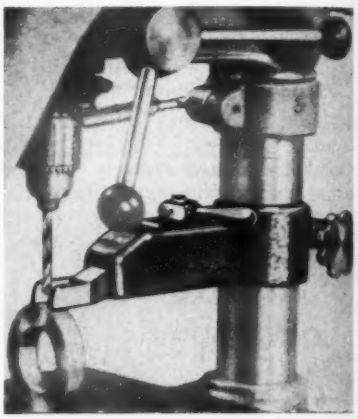
Cutters up to 4" Dia can be handled with the geared-in-ram vertical milling machine. The 2VG features an automatic collet closer for holding cutters in position and eliminating tool slippage, which holds tools up to 1" dia shank size, and roller spindle drive which eliminates backlash. Tree Tool and Die Works, 1600 Junction Ave., Racine, Wis., or — **Circle Inform-A-Gram No. A53.**

Convert Most Straight Side Presses to automatic transfer feed drive operation by means of a self-contained transfer feed unit. Basically an automatic device, the console transfer



feed can also be used to move material through a series of presses. It is operated through one power take-off from the press crank, or may be independently powered and set up to control the press cycle. E. W. Bliss Co., Canton, Ohio., or — **Circle Inform-A-Gram No. A54.**

Eliminate Slipping, reduce drill breakage, and spoilage of expensive material with the Sta-Put. This efficient device for drill press oper-



ators has a split collar which is easily attached to a drill press column and is easily adjusted. The Cincinnati Tool Co., Cincinnati 12, or — **Circle Inform-A-Gram No. A55.**

Clamp Workpieces of any shape with a positive grip on at least 4 points without use of special inserts or attachments with turret jaw vises.

They are available in machine and bench type models with openings from 2" to 8". Hudson Automatic Machine & Tool Co., 137-139 38th St., Union City, N. J. **Circle No. A56.**

GREIST MICRO-SCRIBERS® mark hard metals fast!

Now in 2 sizes... Heavy-Duty and Slim-Line

Solid carbide tip stays sharper, longer! Scribes fine lines on hardened steel, ceramics, plastics, gems, glass.

Diamond lapped to correct tip angle that gives you fast, easy, close-tolerance layouts.

Hexagonal aluminum body—anodized for extra protection. Packaged in clear "plastic bubble" that protects precision tip.

Order a half-dozen from your Greist distributor today! Specify **Heavy-Duty** or **Slim-Line.** Only **$1.00** each.

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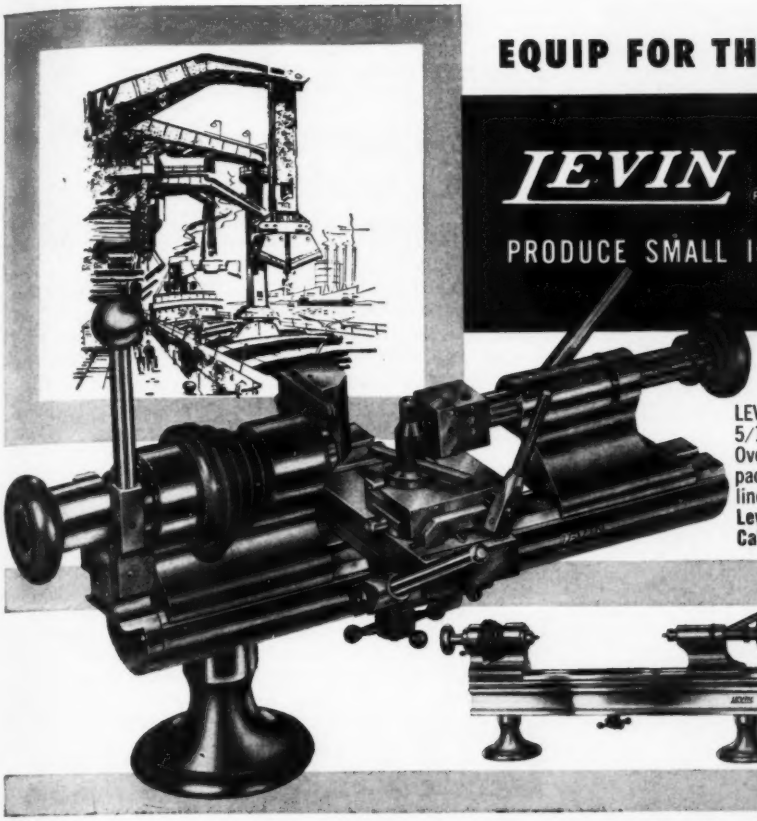
Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 130

EQUIP FOR THE SIZE OF THE JOB

LEVIN INSTRUMENT LATHES

PRODUCE SMALL INSTRUMENT PARTS BETTER



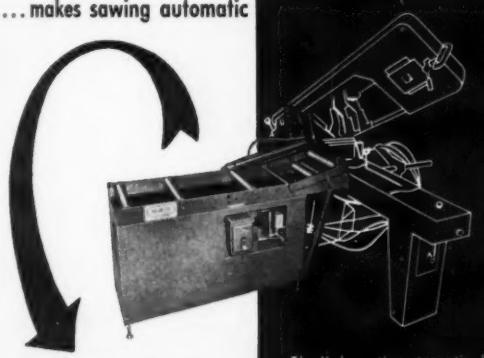
LEVIN lathes are made in two collet capacities, 5/16" or 3/16", and thirty-three different models. Over 150 sizes of collets available in either capacity. Send for catalog "M" describing complete line of instrument lathes and accessories. **Louis Levin & Son, Inc., 3610 S. Broadway, Los Angeles 7, California.**

For efficiency small work should be done on a small lathe. In many cases the work done on an instrument lathe requires a degree of precision and fine finish which cannot be obtained from larger machines.

CIRCLE INFORM-A-GRAM KEY NO. 1311

The **KALAMATIC** ...makes sawing automatic

AUTOMATIC BAR-FEED ATTACHMENT



Featuring:

- Quick easy installation and adjustment.
- Accurate repetitive cutting with no intricate electrical equipment to go out of balance.
- Completely enclosed oil tank and ball bearing table rollers.

The Kalamatic automatically feeds rounds, flats, hex, pipe, tubing to most Kalamazoo metal cutting band saws—any length from 3/16" to 30". Thoroughly automatic, The Kalamatic helps prolong the blade life of the saw.

Machine Tool Division
Kalamazoo
TANK and SILO CO.
508 HARRISON ST.
KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1312

FOR FASTER GRINDING at LOWER COST

USE A.I.T. Diamond Wheels for all Carbide Grinding

RESIN **B-60** Cup Type Diamond Wheel

The exclusive B-60 Bond used in A.I.T. bonded diamond wheels has been field tested in over 400 plants. We can *prove* these superior advantages to you in YOUR plant:

- Faster grinding
- Up to 40% longer wheel life
- One grit size wheel can be used to hog and finish—for extra savings.
- Wheel grinds cooler—does not fracture carbide
- Corners stay sharper longer
- No re-dressing of diamond surface
- NEW BACKING dissipates heat faster
- No down-time for dressing inside body section

Write today for new, FREE catalog and prices

A.I.T. Diamond Tool Co.
8217 N. KIMBALL AVE.
SKOKIE, ILLINOIS

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Remember:

A used tool is proved metallurgically sound and makes a sound tool when reworked.

Systematic "NTS" salvage is the best way to cut cutting tool costs

Stop before you discard a worn or damaged cutter. It may be worth many times its scrap value!

Since 1912 we have been restoring all kinds of cutting tools to new usefulness to help shops control their cutter costs.

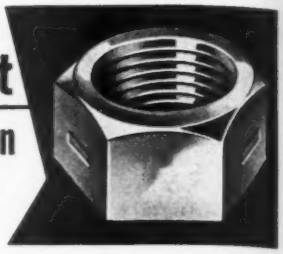
Can we assist you in studying your operations and tool usage to determine if a salvage program will save money in your plant? There is no obligation.

Write for this catalog and the salvage story.

NATIONAL TOOL SALVAGE CO.
6511 EPWORTH BOULEVARD DETROIT 10, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1321

NEW Centerlock Nut saves production time... speeds application



Here is a new low cost lock nut that can be applied from either end, double chamfered, with the locking feature in the center. The greater speed in application of these Centerlock Nuts can make definite savings in production time and provide low cost fastening. Ideal for customer assembled products.

The New Centerlock...

● Can be automatically fed ● Will lock wherever turned on bolt ● Does not depend on friction against work for locking ● Can be applied from either end ● Will not damage bolt threads ● Available in steel, Brass, aluminum or stainless on special order ● Offered in finished series, double chamfered from ¼" thru ⅞" in fine or coarse threads. Machine screw sizes #8, #10, and #12 also available. Heavy series made to special order only ● Also in closed and open end acorn type ● Large inventories carried for immediate shipment. 119

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GRIP NUT COMPANY
107 Maple Ave. South Whitley, Indiana

CIRCLE INFORM-A-GRAM KEY NO. 1322

write to **monroe**
Engineering Products Inc.
1515 Hurd Road, Monroe, Mich.

for fully illustrated catalog with accurate full size templates of assemblies

more than 1,000 details

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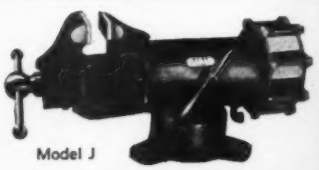
POSITIVE GRIP • SPEED • ADAPTABILITY



Model J

AIR-POWERED TOOLMAKERS VISE
UNIVERSAL DOUBLE SWIVEL

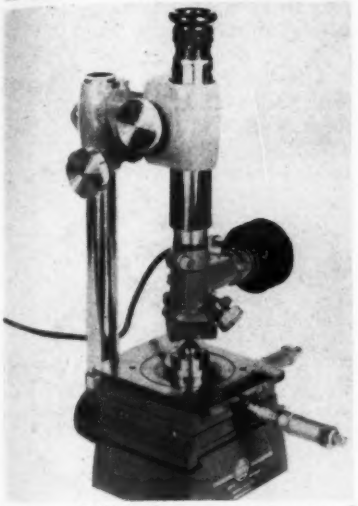
Can be adjusted to any position without removing work from jaws. Furnished with hardened steel jaws and brass caps. Operated by a 6" air cylinder manufactured by Yost. Control kit included with each vise consisting of foot treadle valve, quick exhaust valve and 2 lengths of coupled hose. Jaws can be pre-set to any desired opening. Vise can also be operated manually. Jaw width — 4"; jaw opening — 6"; approx. wt. — 90 lbs.

Write today for bulletin on the complete Yost line

YOST MFG. CO., Cambridge Springs, Pa.

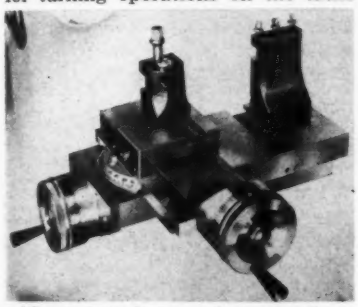
CIRCLE INFORM-A-GRAM KEY NO. 1324

Surface Finish in terms of wave length of light can be checked with the surface finish microscope which uses interference fringes. Roughness of flat or curved surfaces can be



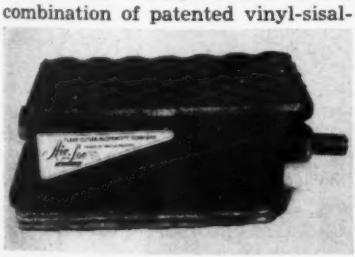
measured directly to an accuracy of 0.000001" without calculations or the use of tables. Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **Circle Inform-A-Gram No. A57.**

A Versatile Slide Rest features a swivel slide which is graduated in degrees and may be swung and used for turning operations on the lathe



without interference between handles or slides. The super slide rest has a top slide travel of 4½", and tool bit size is ⅜" x ⅜". The Wade Tool Co., 49 River St., Waltham 54, Mass., or — **Circle Inform-A-Gram No. A58.**

A Machinery Mount absorbs vibrations and permits instant leveling by the turn of a nut, because of the combination of patented vinyl-sisal-



cork pads with two adjustable wedges. Adjustment of the nut causes movement involving two opposing inclined planes, thus raising or lowering the machine foot under which the mount has been placed. Clark, Cutler, McDermott Co., 130 W. Central St., Franklin, Mass. **Circle InformA-Gram No. A59.**

An 18" Face Grinder is available with power feed to the table. A hydraulic power system with a 2-hp, 1200-rpm motor, the unit provides the equivalent of 50-lb push at the handwheel, which amounts to 600 lbs at the table. Maximum cutting speed is 25' per min and the return is 42' per min. Abrasive Machine Tool Co., E. Providence, R. I., or — **Circle Inform-A-Gram No. A60.**

ARE YOU USING- HOVIS UNIVERSAL Master COMPOUND DIES

to Produce WASHERS and SMALL STAMPINGS from all Types of Materials the ECONOMICAL WAY?

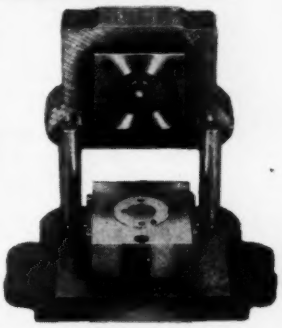
SAVES

DESIGNING COST
TIME • LABOR
MATERIALS
STORAGE SPACE

The "MODERN METHOD" adopted by MANUFACTURERS NATIONALLY

NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART

● By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.



Made in 5 sizes:
¾" - 1½" - 2½" - 4" - 6"

Specialists in designing and manufacturing MULTI-DIES as well as supplying COMPLETE TOOLING FOR ALL SIZES OF NUT FORMERS

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HOVIS SCREWLOCK COMPANY

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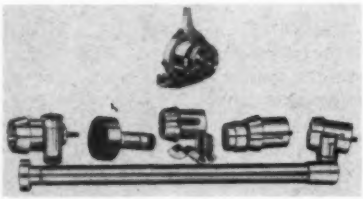
Phone: Slocum 7-4800 Suburb of Detroit

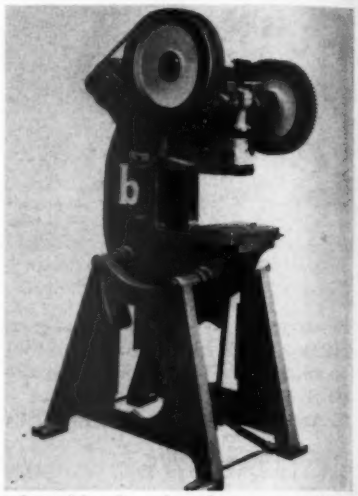
CIRCLE INFORM-A-GRAM KEY NO. 133

For Hard-To-Clean Objects and intricately assembled parts, use a one-gal portable ultrasonic cleaning unit. Powerful sound waves are propelled into the cleaning solution to create an active scrubbing action even on minute, hard-to-reach areas. The unit is also used for degreasing, decontamination, removal of excess flux, mixing, and emulsifying. Hermes Sonic, 13-19 University Pl., New York 3, or — **Circle No. A61.**

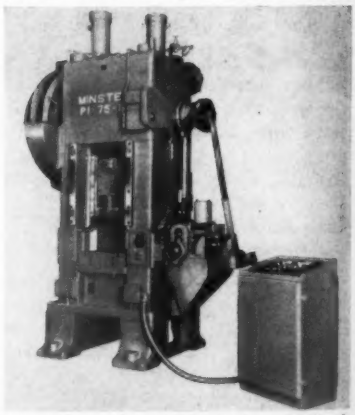
Full Spindle Capacity up to 2⅛" is now possible for taper spindle lathes using the adapters in sizes L-00, L-0, and L-1 with Model B 2" collet chucks. All collet adaptions can now be used with all Hall collet chucks. When the 5-C collets, 5-C pot chucks, or expanding plugs are used in Hall collet chucks, there is no lateral movement. Hall Mfg. Co., 622 Tularosa Dr., Los Angeles 26, or — **Circle Inform-A-Gram No. A62.**



A 10-Ton Press has been equipped with back gearing to prolong inertial force developed by the oversize flywheel over a long ram stroke and to slow ram speed. This makes it adaptable for drawing, expanding, and other jobs where metal flow is desirable. Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif., or — **Circle Inform-A-Gram No. A63.**

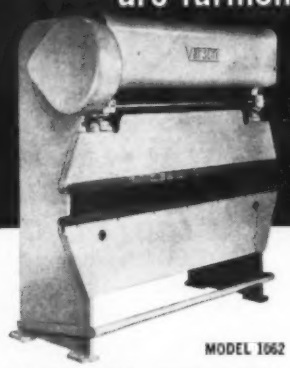


75, 100, and 150-Ton Capacity, single-point, straight-side piece maker presses are available. Model P-1 is especially suited for progressive die blanking and perforating operations that include heavy shock load because this rigid construction eliminates deflection and withstands the vibrations and shocks of automatic operation. Minster Machine Co., Minster, Ohio, or — **Circle Inform-A-Gram No. A64.**



TWO MODELS–NO WAITING

These Verson Power Press Brakes are furnished from stock



MODEL 1062

$2630*

is the full price of this Verson quality press brake, designed and built for top performance. 16 ga. x 78" capacity.

MODEL 16-48

$1600*

will put this power press brake to work in your shop in a matter of days. Capacity is 16 ga. x 48" of mild steel.

Large shop . . . small shop . . . here are economical answers to a wide variety of bending jobs in any shop. Models 1062 and 16-48 are standard Verson Press Brakes available from stock without the annoyance of involved proposals or long delays in delivery.

Here's the chance to put famous Verson all steel construction and proved-in-service Verson design to work for you . . . at a price so attractive, it's hard to believe. Write for complete specifications or if you prefer . . . place your order NOW!

*Prices F.O.B. Chicago, less dies; subject to change without notice.

A Verson Press for every job from 60 tons up. 164

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

Verson

VERSON ALLSTEEL PRESS CO.

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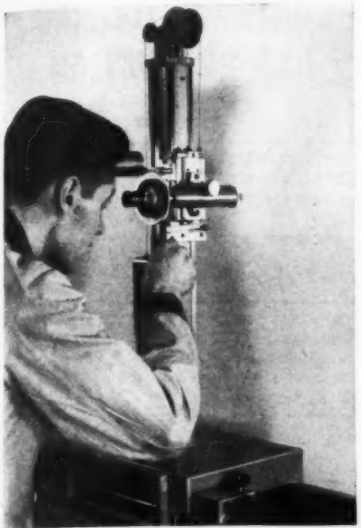
8300 S. Central Expressway, Dallas, Texas

CIRCLE INFORM-A-GRAM KEY NO. 134



M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

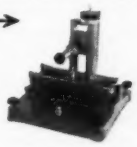
with new Gaertner Coordinate Cathetometers

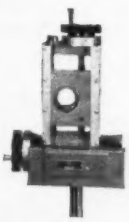
These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.





M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

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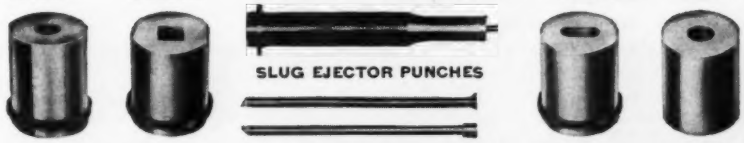
RING PUNCHES AND DIES

STANDARDS

ROUND SQUARE BLANK RECTANGULAR OBLONG PILOT



TYPE R DIES — SLUG EJECTOR PUNCHES — TYPE R DIE TYPE P DIE

HIGH SPEED BEVEL & SHOULDER HEAD QUILLS

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CHOICE OF STEELS
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LOW COST

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Tough alloy retainers accurately machined for Ring Punches and Dies. Ease of mounting saves time and money.

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Large Precision Machining

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We Have 22 Jig Borers

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You Can Rely on a **ROUSSELLE**

THESE 40-TON PRESSES take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are *very moderately priced.*

Significant savings may result if you let our engineering staff assist you. There is no obligation.

Rousselle Presses are sold exclusively through leading machinery dealers.

Choice of 25 models in 5 to 40-ton sizes.

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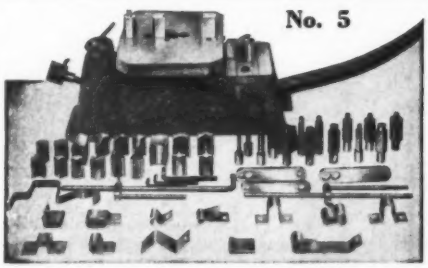
No. 5



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BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air or hydraulic models. The MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛" x 1½" as illustrated. Punching dies available. Other models up to ½" x 8" hydraulic operated. Ideal for steel rule die forming.

ALSO AIR OPERATED MODELS

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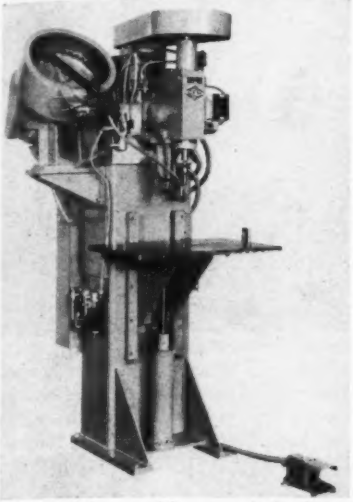
CIRCLE INFORM-A-GRAM KEY NO. 1364

A Heavy-Duty Stud Driving Machine can drive standard studs of up to ⅝" dia. The STD-1 is available with either single or multiple spindles, is equipped with up to 3-hp

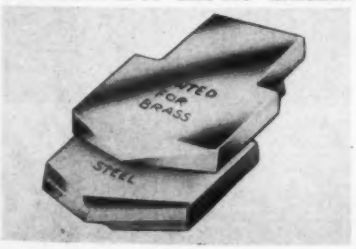


spindle drive, and has an air-hydraulic spindle feed. Capacity ranges up to 1000 cycles/hr. Gray Equipment Co., 13600 Ford Rd., Dearborn, Mich., or —
Circle Inform-A-Gram No. A65.

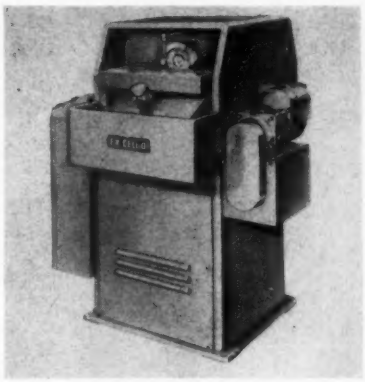
Save Time and Increase Production using the Powershift Preselector lathe. The next speed can be preselected while the tool is cutting, thus reducing idle time. The cor-

rect cut speed for each diameter minimizes tool wear, tool changing, and tool cost. The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, or —
Circle Inform-A-Gram No. A66.

King Size Flat Spot Drills are available in two types for non-ferrous materials and for steel, in the large size. These spot drills are stocked also in 90° and 118° included angle drill points, ground either for brass or for steel and with either right or left hand cut. B. & W. Precision Products Co., P. O. Box 3865, Detroit 5, or — **Circle No. A67.**



Conventional Grinding and Chip Breaker Grinding can be done on the same machine. The reciprocating tool grinder comes in two models: one for vitrified or diamond wheels, and the other equipped with metal-bonded diamond wheels for electrolytic grinding. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or — **Circle Inform-A-Gram No. A68.**



FOR HARDENING AND TEMPERING ALL TOOL STEELS

HEVI-DUTY High Temperature "G-05-PT" FURNACE
Hardening of high speed steels and other operations requiring high temperatures can be performed in this furnace. The muffle may be sealed if a protective atmosphere is required.
Temperatures to 2600°F.

HEVI-DUTY "Multiple Unit" MUFFLE FURNACE
This complete self-contained furnace is ideal for small scale production heat-treating requiring temperatures to 1850°F. All controls are conveniently mounted in the pyramid base.
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HEVI-DUTY "Multiple Unit" TEMPERING FURNACE
Forced, high speed air circulation assures rapid and uniform heating for tempering all tool steels. Removable shelves provide greater capacity, yet this furnace requires little bench space.
Temperatures to 1250°F.

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MILWAUKEE 1, WISCONSIN
Heat Treating Furnaces... Electric Exclusively
Dry Type Transformers *Constant Current Regulators*

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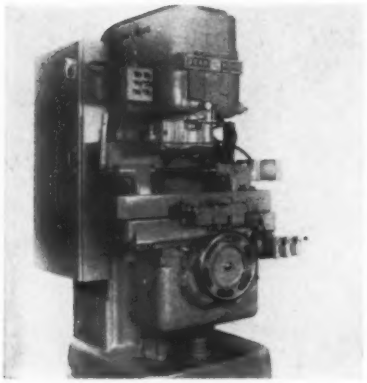
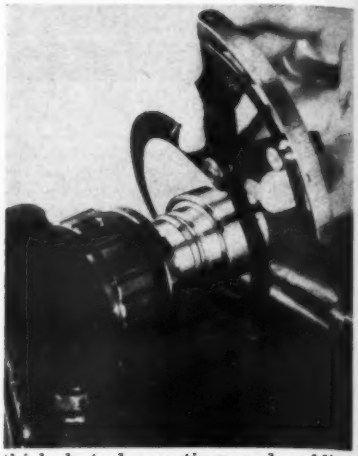


Constant-Pressure and Zero-Backlash Methods for honing hardened gear teeth are provided on Model GHB gear tooth honing machine. For removing nicks and burrs and improving surface finish of hardened gears, a constant-pressure arrangement is provided by the tilting table. Two models are offered for gears up to 8" and 12" pitch dia. National Broach & Machine Co., 5600 St. Jean, Detroit 13, or — **Circle No. A69.**

Save Time and Effort while measuring parts and materials with the direct reading caliper. Model 1404 not only measures bar stock, sheet stock, and lathe turnings up to 4" thick, but also castings and molding of irregular shapes. The size is read directly on a 0-4" scale calibrated in inches by 32nd's. Master Specialty Co., Inc., 3725 Monitor Ave., Minneapolis 26, or — **Circle No. A70.**



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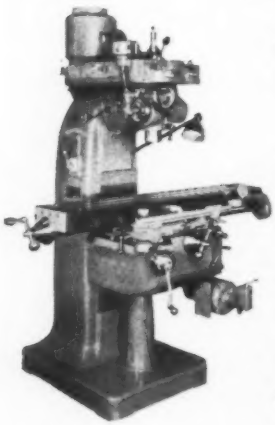
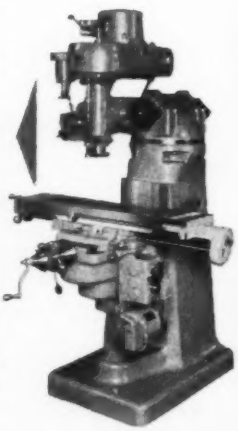
1½ HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.



"45" MILL

Unique square design of overarm affords more rigidity, greater accuracy . . . Provides extra range and capacity . . . More power at the cutter. No adjustment required on overarm and head after use . . . No need to re-indicate head after moving overarm . . . Speed range with nine changes makes possible the use of high speed or carbide tipped cutters to best advantage.

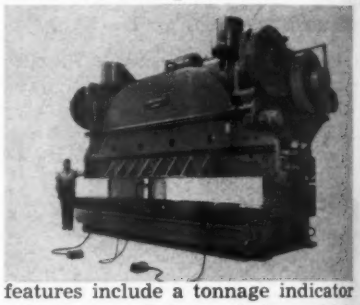


INDEX MACHINE CO.

541 N. MECHANIC STREET JACKSON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 138

A Combination Clutch Control allows choice of manual foot-treadle operation or air-electric operation by means of foot switches on the 21 series Cincinnati press brake. Other features include a tonnage indicator and two-speed transmission which permits operation at 7 or 30 strokes/min. The Cincinnati Shaper Co., Cincinnati 25, or — **Circle No. A71.**



A 32/42 Oz Plastics Injection Molding Machine has been added to the line by The Hydraulic Press Mfg. Co., Div'n of Koehring Co., Mt. Gilead, Ohio. This 650-ton unit, with a total of 107½ hp, features an extremely high injection rate of 2510 cu in of material/min, exceptionally fast cycling of over 300 cycles/hr and a mounting area of 30" x 48". **Circle Inform-A-Gram No. A72.**

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Preis is the "one source" solution for your engraving problems. Complete line of accessories and attachments are available for all makes and models.

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complete with cord, plug, switch ready to use **$89.95**

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- **DULL TOOL CONTROL** Unit will withdraw tool from work and indicate to operator when tool becomes dull.
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- **COMPLETELY AUTOMATIC** Enclosed electric controls. Unit is "Fail Safe".
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- **FEED CONTROL** Infinitely variable and positive feed rate.
- **RAPID APPROACH AND RETURN** Variable irrespective of RPM.
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- **EMERGENCY QUILL RETURN** Button on front of unit. Aid in setting tools.
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- **PRODUCTION MACHINE** Mount in any position. Quiet operation. Self lubricating.

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Wilmerding, Penna.

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Quality Control plus Cost Control

Wilder MICRO-PROJECTOR with VERTICAL LIGHT BEAM

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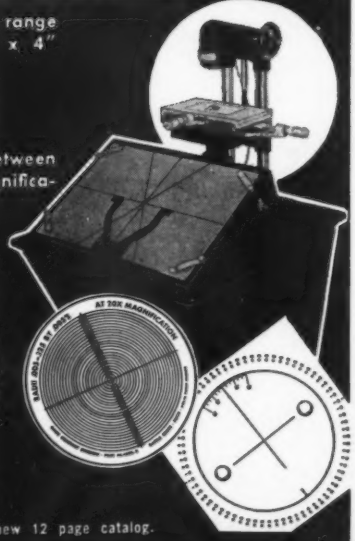
DO IT BETTER

Full set of lenses between 10X and 100X magnifications.

QUICKER

Completely versatile. Available as a basic unit for production inspection or as a completely equipped contour measuring projector.

AT LESS COST



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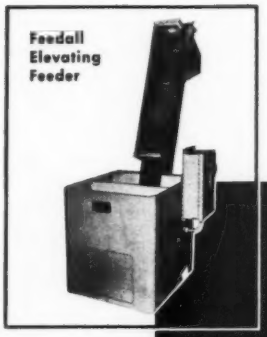

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RECESS SWING TOOLS
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47 years experience goes into every tool we make. They come to you ready for use . . . Precision design . . . Skilled workmanship . . . Finest materials.

Our extensive facilities save you TIME . . . MONEY . . . and give you accuracy, quality and quick service.

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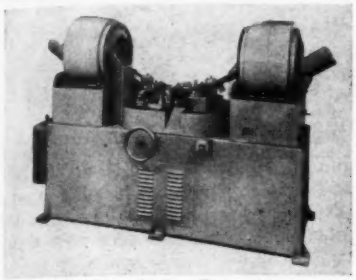
1871 Clybourn Avenue • Chicago, Illinois

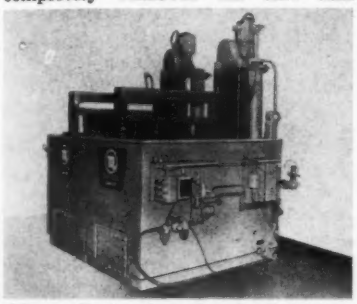
CIRCLE INFORM-A-GRAM KEY NO. 1404

A Planetary Thread Rolling Machine can thread roll screws, bolts, and nails at speeds of 600 to 800 pcs/min. It handles overall blank stock lengths up to 3" and diameters



from No. 4 to 5/16". Operations performed are thread rolling, roll forming, knurling, marking, serrating, and necking. Rear loading can be done during production. Prutton Corp., 5203 W. 130 St., Cleveland 30, or—**Circle Inform-A-Gram No. A73.**

Automatic Cylinder Head Cleaning is accomplished at low unit cost using a Magnus Gyro-Vertical Aja-Lif cleaning machine combining vertical and rotary agitation of the work. It completely removes all dirt and

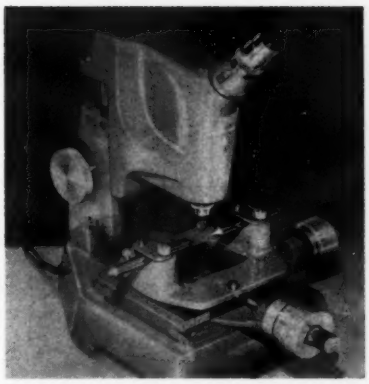


chips, eliminating hand finishing. The machine is designed for optional agitation of the work below the liquid with a 3 to 5" stroke. Equipment Div'n, Magnus Chemical Co., Inc., Garwood, N. J., or —
Circle Inform-A-Gram No. A74.

Universal Joint Type Drillhead in standard sizes up to 12 spindles are being built by The Thriftmaster Products Corp., 1012A N. Plum St., Lancaster, Pa. Although full ball bearing construction is standard, for close center distance operations, bronze bearing mounted spindles can

be supplied. The full ball bearing and bronze bearing spindles are interchangeable in order to provide flexibility in drilling to patterns.
Circle Inform-A-Gram No. A75.

Inspection and Measurement of Drills, taps, jigs, templates, broaches, etc., can be made with ease with the toolmakers' microscope. The total range of magnification with interchangeable eyepiece and objective lenses is 27X to 360X. Standard lenses supplied give magnification of 35X. The DoAll Co., Des Plaines, Ill., or — **Circle No. A76.**



T-J spacemaker cylinder

Quality Engineered

to give quality results

with Extras . . .
at No Extra Cost!

You get more—much more—when you specify and use any of T-J's complete line of Spacemaker cylinders. The Spacemaker is engineered to give you better, more accurate, and longer service—offers, exclusively, many extras . . . that are STANDARD, AT NO EXTRA COST!

Designed to eliminate tie-rods, providing greater strength . . . saves space . . . reduces manhours and costs in all push-pull-lift operations. OFF SHELF DELIVERY in a wide range of styles and capacities, with 64,000 combinations. Write for catalog SM 56-2 with complete engineering details. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

METAL PISTON ROD SCRAPER . . . Standard at No Extra Cost!

NEW "SUPER" CUSHION FOR AIR . . . Standard at No Extra Cost!

CHROME PLATED CYLINDER BORES AND PISTON RODS . . . Standard at No Extra Cost!

ONE PIECE PISTON . . . Standard at No Extra Cost!

NEW "SELF-ALIGNING" MASTER CUSHION FOR HYDRAULIC USE . . . Standard at No Extra Cost!

NO TIE-RODS TO STRETCH . . . Standard at No Extra Cost!

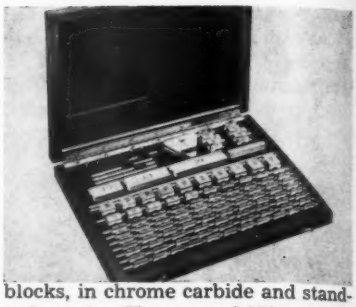
STREAMLINED DESIGN . . . Oil Pressure to 750 P.S.I.—air to 200 P.S.I. Standard at No Extra Cost!

FORGED SOLID STEEL HEADS . . . Standard at No Extra Cost!

CIRCLE INFORM-A-GRAM KEY NO. 141

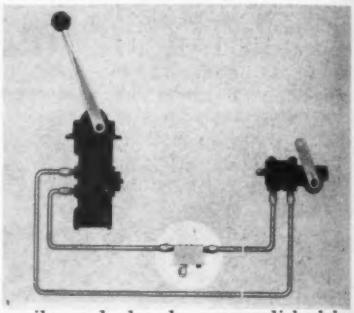
Use a Two-Chamber Oven for relief of hydrogen embrittlement on plated parts and stress relieving and normalizing of tools, springs, etc. The two chambers operate independently and have individual maximum operating temperatures. Electric heating is employed. Both chambers have a work space of 24" x 24" x 18" with single doors and one control panel. Grieve-Hendry Co., Inc., 1401 W. Carroll Ave., Chicago 7, or—**Circle Inform-A-Gram No. A77.**

Interchangeability With All Other Square Gage Blocks is one of the features of a line of square type gage



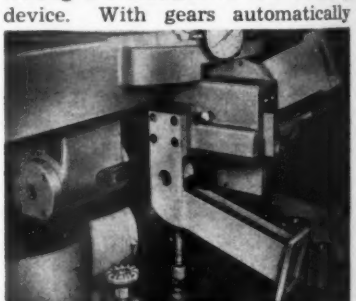
blocks, in chrome carbide and standard steel. They are 0.950" square with an approximate ¼" hole for tie rods. They are produced in a complete range of sizes, available as individual or replacement blocks or in sets of various numbers. Webber Gage Co., 12912 Triskett Rd., Cleveland 11, or — **Circle No. A78.**

Eliminate Accessory Pressure Equipment with a manual, remote control system with integral filler-bleeder fitting. Filling the system with oil and bleeding it of air is



easily and cleanly accomplished by leading two lines from the fitting directly to the fluid supply and utilizing the master control lever as a pump. The Hydronic Co., 12685 Arnold Ave., Detroit 39, or — **Circle Inform-A-Gram No. A79.**

An Automatic-Loading Device with automatic ejection is used on universal rotary gear finishing machines. Speed and positive positioning are features of the loading device. With gears automatically



fed from a demand-type parts-distribution system, the device permits one operator to handle a battery of machines. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or — **Circle Inform-A-Gram No. A80.**

FEED UP TO 12" PER PRESS STROKE!

Never before such press feeding ACCURACY... such simple compactness!

A "standard" off-the-shelf Rol-Di-Feed so versatile, so economical, it will save hundreds of dollars—do the most rugged press feeding jobs without wonder, worry or waste!

Compact—YES! . . . feeds front to back, back to front, right to left, left to right—and *diagonally!*

That's Versatility plus! A new 12" feed, a new feeding principle, a new profit in *your* press feeding operations!

Dickerman

H. E. DICKERMAN MFG. CO.

413 Albany St. • Springfield, Mass.

Send for literature—have a Dickerman Representative call. Would you like a demonstration on *your* material?

CIRCLE INFORM-A-GRAM KEY NO. 142

Punches and Dies

...for foot and power presses

Standard Punches and Dies of all sizes and shapes in stock—or made promptly to order. Also Adaptors and Die Shoes to convert your press. For power, foot or hand operation.

Round, square, rectangular, slotting, notching, louvre, angle, multiple, knock-out and other shapes. Precision made from high grade tool steel. More than 25,000 sets in stock to choose from.

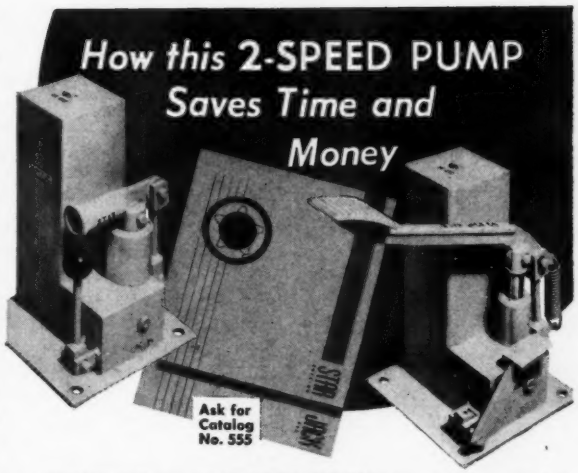
25th ANNIVERSARY 1933 1958

Send for free illustrated catalog No. 154-AF NET PRICE SHOWN! What are your punch and die needs?

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1431

How this 2-SPEED PUMP Saves Time and Money



STAR Hi-Lo 2-SPEED PUMP (hand or foot model) operates at high speed, brings ram to load 6 to 15 times faster than a single speed pump, then automatically changes over to high pressure. Maximum capacity 10,000 psi.

SPEEDS WORK, SAVES EFFORT

Safety overload valves, oil capacity 160 cu. in. or larger, chrome plated concentric pistons 1¼" and ½", 1½" and ½", 2" and ½", all with 1½" stroke.

Special engineering counsel and proposals cheerfully submitted on request.

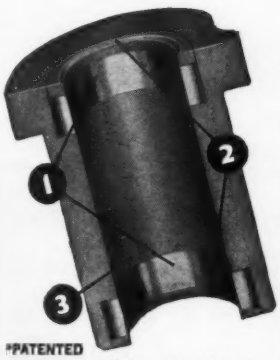
Representative areas available.

HYDRAULIC AND AIR-DRIVEN STAR JACK COMPONENTS

STAR JACK CO., INC.
420 LEXINGTON AVE., Dept. T&P, N.Y.C. 17
PLANT: RIVER GROVE, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1433

INCREASE PRODUCTION.. SAVE TIME & MONEY



*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for MEYCO Bushing Catalog No. 41

MEYCO

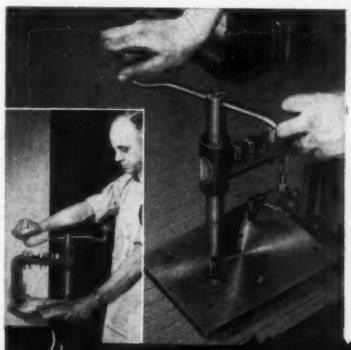
Carbide Inserted Bushings Are Doing It Daily!

How? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that approach the price of steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

ESTABLISHED 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1432



quicker precision tapping CUTS COSTS

$59.50 FOB FACTORY

Dahlstrom Tap Guide

- *Do precision tapping by hand*
- *Tap by lathe with spindle*
- *Tap through open bases for big jobs*
- *Carry to jobs or fasten to bench*
- *Serves as a handy tap extension*

REDUCE TAP BREAKAGE IN YOUR SHOP!

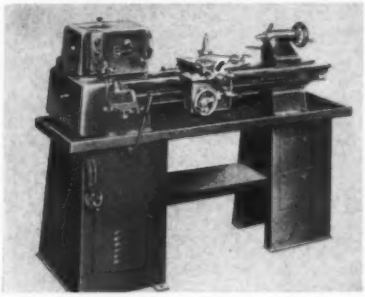
The Dahlstrom Tap Guide works straight and square to eliminate most costly tap breakage. Anyone can operate it—just slip a tap and adaptor into the spindle and turn the handle. Equipped with nine adaptors from 8-32 to ¾" (taps not furnished) . . . depth of throat 7½", opening 7" . . . 8 x 11¼" table area . . . wt. approx. 32 lbs. Order this tap-protecting time saver for YOUR shop.

Ask for the illustrated bulletin that includes information on the $1.75 Dahlstrom Automatic Stock Feed Stop.

Branch **MANUFACTURING COMPANY**
16 Olsen Drive, North Branch, Minn.

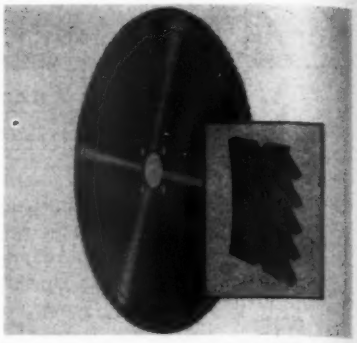
CIRCLE INFORM-A-GRAM KEY NO. 1434

A Powerful 12¾" General-Purpose Lathe has a wide adaptability for the efficient machining of all work within its capacity. The quick-change



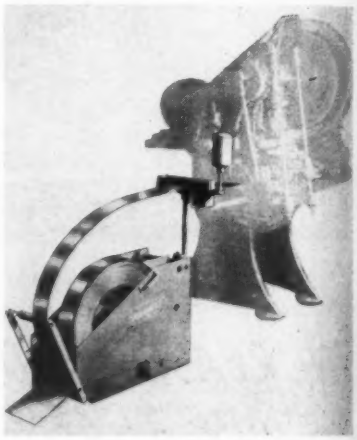
mechanism provides instant selection of 54 threads or feeds on the 5400 series lathes. Variable speed countershaft makes available speeds from 35 to 270 rpm and 210 to 1600 rpm while the lathe is running. Clausing Div'n, Atlas Press Co., 26115 N. Pitcher St., Kalamazoo, Mich., or — **Circle Inform-A-Gram No. A81.**

Reduce Friction and prevent metal adhering to sides of the saw teeth using Insto high-speed steel segmental cutting saws. This is made possible by the alternating of roughing and finishing teeth. This design



assists the flow of the lubricant to cutting edges, which cools the saw and increases saw life. Ernest F. Donley's Sons, Inc., 10203 Miles Ave., Cleveland 5, or — **Circle No. A82.**

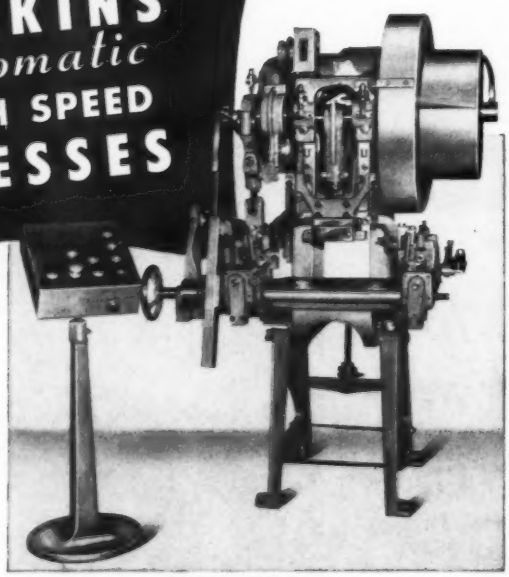
24" by 48" Dia and up to 3000 lbs weight stock can be handled by the Poweroll coil cradle and clean-oiler,



and can be loaded by one man in one min. The metal coil is simply rolled up the ramp onto the power driven rollers, eliminating the need for crane or hoist. The Medelton Co., Inc., 335 E. 142nd St., Bronx 54, N. Y., or — **Circle No. A83.**

AUTOMATION!

PERKINS
automatic
HIGH SPEED
PRESSES



Wichita Air Clutch

Double Roll Feed
with By-Pass Top Lifts

Scrap Chopper

Pedestal Control

MODEL 300 B

Here is an automatic machine that will give you the most efficient speed and best production. It is equipped with an accurate double roll feed which has a by-pass type of automatic lifts, a scrap chopper actuated from the crankshaft, a variable speed drive, a Wichita Air Clutch, pedestal type of press controls, and variable top stop control. It is equipped with automatic lubrication and bronze gibs. Built in sizes of 10, 15, 20, 27, 35, 45, 60, 75 and 100 tons capacity.

PERKINS
MACHINE CO. WARREN, MASS.
PRESS BUILDERS FOR OVER 50 YEARS

CIRCLE INFORM-A-GRAM KEY NO. 144

Further information about Editorial Items and Advertised Products can be obtained by circling the key number of the Editorial Item or Advertisement on the Inform-A-Gram Card and mailing. Postage is prepaid. The Inform-A-Gram Card follows page 162.

ROTARY BUSHINGS

For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.
42322 ANN ARBOR RD., PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

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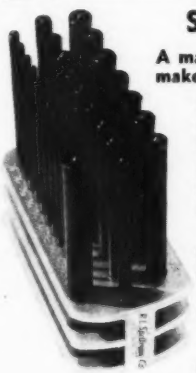


SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1452

Don't overlook these ways to cut production costs!

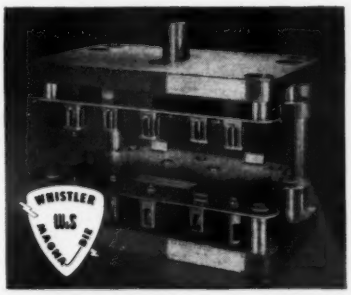
OK OK SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS • WORK-REST BLADES • CUT-OFF BLADES • SCRAP CHOPPERS • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

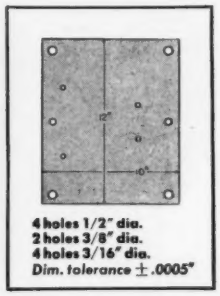
THE OHIO KNIFE CO.
CINCINNATI 23, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1453

WHISTLER MAGNA-DIES
open the way to big savings

Over $2500 saved on these four typical jobs... Here's a specific example showing how Whistler Magnetic Perforating Dies are used and re-used to push die costs down to a rock bottom low:

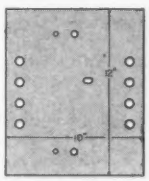




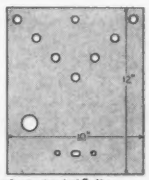
4 holes 1/2" dia.
2 holes 3/8" dia.
4 holes 3/16" dia.
Dim. tolerance ±.0005"

$106 SAVED ON JOB NO. 1...EVEN INITIAL INVESTMENT IS LESS

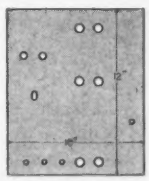
This Whistler Magna-Die unit includes a 12" x 14" die set, 10 punch and 10 die retainers, 10 punches, 10 die bushings, 10 strippers, 3 gages and one set of templets. The complete price with templets jig bored and gages mounted for producing the 10-hole part shown above: $819.00. The approximate cost of a custom die to do the same job: $925.00. From the very start, you start to save with a Whistler Magna-Die.



8 holes 1/2" dia.
2 holes 3/8" dia.
2 holes 3/16" dia.
1 oval hole 3/8" x 1/2"
Dim. tolerance ±.0005"



1 hole 31/32" dia.
7 holes 1/2" dia.
1 hole 3/8" dia.
2 holes 3/16" dia.
1 oval hole 3/8" x 1/2"
Dim. tolerance ±.0005"



6 holes 1/2" dia.
2 holes 3/8" dia.
4 holes 3/16" dia.
1 oval hole 3/8" x 1/2"
Dim. tolerance ±.0005"

$710 SAVED ON JOB NO. 2. All of the original punch and die parts (with the exception of 2 punches, 2 bushings and 2 strippers) are re-used here. The additional tooling required, plus bored templets with gages mounted, cost $389.79. The approximate cost of a custom die to produce this part: $1100. *Savings pile up with each succeeding job...$816 so far.*

$793 SAVED ON JOB NO. 3. Through the use of another punch and die retainer unit, a 31/32" punch, die bushing and stripper plus a new set of bored templets with gages, this part is produced at a die cost of $246.81. In this case, the cost of a custom die would amount to approximately $1040.00. *Savings now reach $1609.*

$925 SAVED ON JOB NO. 4. As more Whistler punch and die parts are accumulated, die costs for each succeeding job usually go down even further. Here, for example, only a new set of templets, jig bored to the 13-hole pattern, is needed. The cost: $163.55. A custom die for this job would run approximately $1089.00. Total savings for these first four jobs alone amount to approx. $2535.

EACH JOB CAN BE RE-RUN AT ADDED SAVINGS, TOO!

Punch and die parts can be quickly re-assembled to re-run any one of these four jobs. All it takes is approximately 10 minutes for press changeover. Whistler Magna-Dies cut downtime and remove production bottlenecks by avoiding the extra time required to obtain custom dies. They can be used on practically any press with a minimum shut height of 9½" for perforating materials up to and including ¼" mild steel.

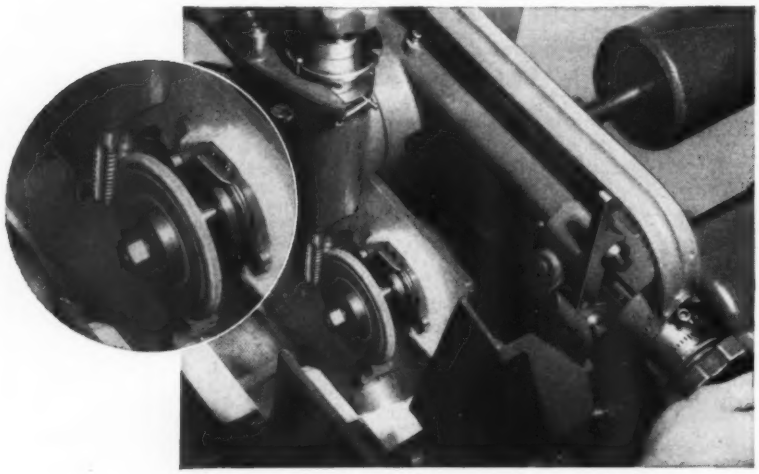
GET COMPLETE DETAILS AND PRICES BY WRITING FOR CATALOG M-551

S. B. WHISTLER & SONS, Inc.
748 MILITARY ROAD, BUFFALO 23, N. Y.
Manufacturers of Adjustable, Magnetic and Custom Built Dies for All Industry

CIRCLE INFORM-A-GRAM KEY NO. 1454

NOW – You can control rake or hook angle and insure accurate indexing of cutting edges* of taps with the BLAKE FLUTE GRINDER.

**Just as necessary on taps as on milling cutters.*



Keep it sharp — Make 1 tap do the work of 6 with The Blake Flute Grinder.

This accuracy will result in uniformity of hole, much longer life for your taps and a surprising savings in tap costs.

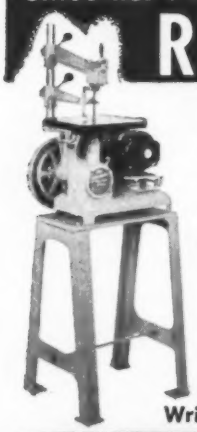
Write for bulletins on BLAKE Tap Sharpening Machines

EDWARD **BLAKE** COMPANY INC.
MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS
442 CHERRY ST., WEST NEWTON 65, MASS.
Exclusive Distributors of:
Black Diamond Drill Grinders • Surface Finish Standards • Worcester Drill Grinders.

CIRCLE INFORM-A-GRAM KEY NO. 1461

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE



DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.
This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS
. . . for high speed Precision Grinding of Curved and Irregular Contours.
Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY
228 PARK AVENUE BELGIUM, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1462

FORD
rotary tools

WHY THEY DO YOUR JOB BETTER

All Ford files H. S. S. and carbide cutters are *precision machine ground* . . . which insures that tooth spacing is uniform and relief angles are constant on each tool. Ford files are handcut by precision craftsmen. On your job, that means more parts per grind. So you save labor on grinding and tool changing. You save on replacements. You save on downtime. What's more, there's less time per part, more parts per hour. In 7 shapes . . . cutting head sizes from ⅛" to 1" diameter, up to 1⅜" in length. All standard, and *available* in H. S. S. or solid carbide.

Rotary FORD Tools

NEW CATALOG 601 FREE AND LATEST PRICES

. . . WRITE TODAY

M. A. FORD MFG. CO., INC.
817 W. RIVER STREET, DAVENPORT, IOWA

Precision manufacturer of Carbide End Mills • Countersinks • Grinding Burrs • Special Tools • Factory Regrinding

CIRCLE INFORM-A-GRAM KEY NO. 1463

PUBLICATION PREVIEWS

CATALOGS • BULLETINS • SPECIFICATIONS

Circle Inform-A-Gram key number on postage-free Reader Service Card for your request.

400 Components for Jigs and Fixtures and 200 clamping items are covered in a catalog from Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, Ohio. A scale size tracing template of all jig and fixture components is included.

Dimensions in chart form are given for each type of part. Write to the company for your copy of Catalog 28, or—**Circle Inform-A-Gram No. B1.**

Plastics and Resins are the subject of a booklet which is a quick guide to the uses of these products. One section is devoted to melamine, urea, and alkyd molding compounds and nylon molding and extrusion compounds. Copies of "Plaskon Plastics and Resins in Brief" is supplied by Barrett Div'n, Allied Chemical & Dye Corp., 40 Rector St., New York 6. **Circle Inform-A-Gram No. B2.**

Center Drill Head and automatic index table are offered in a bulletin from ConRay Corp., 29 W. Apple St., Dayton, Ohio. The bulletin contains a schematic drawing of both units and shows the patented two-level gear train which transmits the power to the drill head. Write to the company for a copy of Bulletin DH-957, or—**Circle Inform-A-Gram No. B3.**

150 Silicone Products are described in the 1958 Dow Corning Reference Guide. It contains detailed charts, tables, graphs, and data on properties and performance, along with illustrated examples on how silicones can cut costs and simplify design. Bulletin 1-113 is published by Dow Corning Corp., Midland, Mich., or — **Circle Inform-A-Gram No. B4.**

Use Toolholders and Inserts outlined in a 56-page manual and effect substantial savings machining costs. Completely indexed, the manual covers in detail the selection of the toolholders to fit specific metal-cutting jobs. Copies of the Manual VR-438 are available from Vascoloy-Ramet Corp., Waukegan, Ill., or — **Circle Inform-A-Gram No. B5.**

Single Acting Air Presses are featured in a bulletin from Hugold Anderson, Inc., 70 Ernest St., Providence 5. Keyed ram, adjustable screw stop, honed and chrome plated cylinder, and hardened and ground ram and piston rods are discussed. Write to the company for a copy of Bulletin TP-1, or — **Circle Inform-A-Gram No. B6.**

A FULL WILSON LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

FULLY AUTOMATIC
•
SEMI-AUTOMATIC
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REGULAR
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SPECIAL
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SUPERFICIAL
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MICRO & MACRO HARDNESS TESTERS

When it's WILSON "ROCKWELL"-TESTED *you KNOW it's RIGHT!*

Easy to operate—all controls at hand. *Takes rough service*—maintains accuracy after years of operation.

Expert Wilson Service—helps you choose proper model...keeps it at work. A staff of WILSON hardness testing experts is available to provide quick emergency service if it is ever needed.

The booklets listed below give complete and helpful data on the indicated WILSON *equipment...*

DH-325 for "Rockwell" Regular
DH-326 for "Rockwell" Superficial
DH-327 for Accessories & Specials

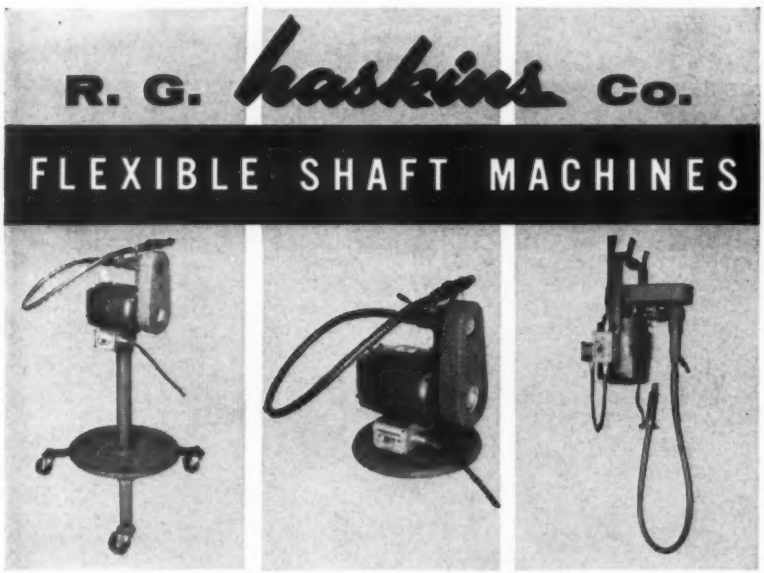
ACCO **WILSON**
MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE
230-TP Park Avenue, New York 17, N. Y.

Write for one or all of these booklets
DH-325
DH-326
DH-327

CIRCLE INFORM-A-GRAM KEY NO. 147

The New Spiral Point concept in drill point geometry and the Spiropoint drill sharpener for applying it to standard twist drills are described and illustrated in a brochure. Featured in the brochure are the differences of the conventional drill point and the spiral point design and the advantages of the latter. Request copies of Brochure SP-57-1 from Cincinnati Lathe and Tool Co., Cincinnati 9, or —
Circle Inform-A-Gram No. B7.

Bottom Drive Mechanical Presses are outlined in a 32-page bulletin. Included are typical specifications of single, double, and triple action presses, as well as a description of the various types of accelerated slide motions available. A section discusses the advantages of two level press rooms possible with bottom drive presses. Write to Clearing Machine Corp., U. S. Industries, Inc., 6201 W. 63rd St., Chicago 38, or —
Circle Inform-A-Gram No. B8.



faster Haskins machines will speed production on a big variety of metal-working jobs with their continuous speed and unerring performance. And there's no need to worry about changing tools—it takes just seconds to switch to any one of the numerous metal-working attachments in the Haskins line. *Use Haskins equipment and eliminate interruptions.*

easier Haskins flexible shaft machines make the whole operation a simple matter. They're portable—ready to go to work in whatever spot you choose, even remote sections of your plant. Operators say Haskins machines are easy to use because they have to hold only the lightweight handpiece which permits greater accuracy for close, precision work. You should know about Haskins flexible shaft machines and accessories-*leaders in their field for over 30 years.*

Write Today for a Catalog and Literature

R. G. HASKINS Co.

605 S. Washtenaw Street Chicago 12, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 148

Silent Chain Drives are offered in an 88-page booklet which contains detailed engineering data and illustrations of silent chain's versatility in wide range of applications. Models

include tiny fractional horsepower drives and huge drives transmitting thousands of horsepower. Contact Link-Belt Co., Prudential Plaza, Chicago 1, for copies of Booklet 2425, or
Circle Inform-A-Gram No. B9.

A 30-Page Data Bulletin gives engineering specifications for squarehead hydraulic cylinder line. Of tie-rod construction, the line is rated for 2000 psi working pressures with up to 3000 psi in nonshock service. All mountings are available and standard bores range from 1½" through 12". Write Anker-Holth Div'n of Wellman Engineering Co., 2723 Connor St., Port Huron, Mich., or —
Circle Inform-A-Gram No. B10.

Use Work Benches, Tool Stands, shelving and other pressed-steel shop equipment in the shop, laboratory, and assembly line. These products are described and illustrated in an 8-page bulletin. Construction features and specifications of size, bench top materials, and equipment variations offered are also given. For copies of the bulletin write to Standard Pressed Steel Co., Box 600, Jenkintown, Pa., or —
Circle Inform-A-Gram No. B11.

Three Index-Method Milling Machines are described and pictured in a series of bulletins available from The Producto Machine Co. A twin horizontal-spindle, overhanging-head miller, a model arranged for combined horizontal and vertical feed, and a four-division automatically-indexed milling machine are presented. The Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn., will supply copies of Special Bulletins 1, 2, and 3.
Circle Inform-A-Gram No. B12.

FRICTION SAWING with Tannewitz
HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

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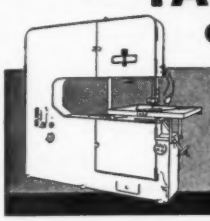
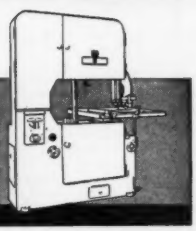
GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



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CLARK SPADE DRILLS
for lower cost per hole!
Easily reground to smaller diameters. Shanks drilled for coolant circulation. Straight or Morse tapers. Standard sizes 1 1/16" to 5", other sizes on order. Prompt delivery!

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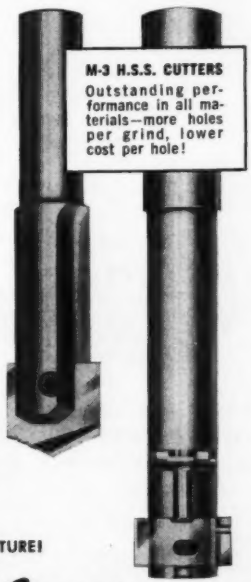
Free floating action, instant blade removal without destroying the set-up. Sizes: Finishing ⅝" to 6"; Roughing 1" to 6". Straight shank or Morse tapers. Other sizes on order.



M-3 H.S.S. CUTTERS
Outstanding performance in all materials—more holes per grind, lower cost per hole!

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9330 Santa Monica Blvd., Beverly Hills, California

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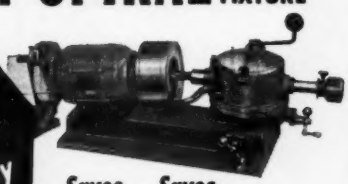
Super MULTI-SPIRAL END MILL GRINDING FIXTURE

SHARPENS END MILLS Quickly... Completely IN YOUR OWN SHOP



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Cut Operations 75% or More!

Custom-designed, precision made, exactly to fit your needs. Boost both output and quality. Ask for details.

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CIRCLE INFORM-A-GRAM KEY NO. 1493

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Bet You've Never Seen a Slicker, Mirror-like Finish!

Send now for full details and prices.

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MANDRELS
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EFFICIENT—LOW COST

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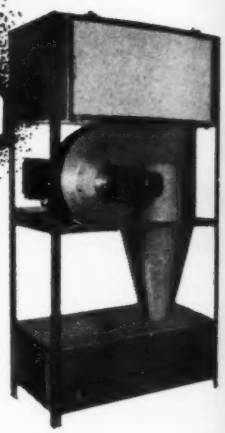

Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM
• READY TO USE

Also a Complete Line of Mist Collectors

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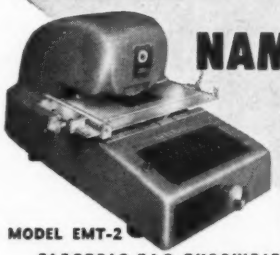
CIRCLE INFORM-A-GRAM KEY NO. 1502

CUT PRODUCTION COSTS!
MARK
NAME PLATES
5 TIMES FASTER



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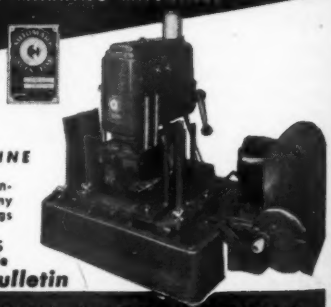
ELECTRIC TAG TYPEWRITER
A touch of the finger delivers up to 2 tons pressure for deep, legible impressions in metal or plastic tags.

—WITH—
Automark
ELECTRIC TAG MARKING MACHINES



MODEL SRST-2
HI-SPEED
TAG MARKING MACHINE
Automatically marks BOTH constant and serial numbers at any desired speed up to 8,000 tags per hour!
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Some Territories Still Available
Send Now for Bulletin

DEFIANCE MACHINE & TOOL COMPANY
1920 S. VANDEVENTER Dept. PT ST. LOUIS 10, MO

CIRCLE INFORM-A-GRAM KEY NO. 1503

Blast Cleaning can be done with the continuous Tumblast with end discharge. This machine, outlined in a bulletin, is designed to handle a continuous flow of miscellaneous work at a high rate of production.

Mechanical and electrical specifications are listed in the bulletin. Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind., supplies copies of Bulletin 141-D, or —
Circle Inform-A-Gram No. B13.

Precise Circular Spacing and Angular Positioning is done automatically with the 42" plain rotary table equipped with numerical control. This table is the subject of a bulletin which also gives advantages and specifications of the table and explains the planning chart data which can be fed into the table by punch tape or the operator's console. For more information write to Pratt & Whitney Co., Inc., Charter Oak Blvd., W. Hartford 1, Conn., for a copy of Bulletin 612, or —
Circle Inform-A-Gram No. B14.

"Basic Facts on Unitized Tooling" is the title of a brochure published by Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y. It graphically illustrates and describes the fundamental principles of this economical type of tooling. Included are typical setups and mounting methods for presses and press brakes, and tooling cost comparisons. Contact the company for copies of the bulletin, or —
Circle Inform-A-Gram No. B15.

Milling Machines, milling machine attachments, and drilling machines are highlighted in a new bulletin. Each machine is illustrated with a list of advantages and features. Complete specifications for these models are also given. The bulletin is available from Index Machine Co., 543 N. Mechanic St., Jackson, Mich., or —
Circle Inform-A-Gram No. B16.

Speedi-Set Plastic Molding Compound, a single component thermosetting flexible plastic, is the subject of a bulletin. It is used in making molds for casting cold setting ceramics and plastics. Information on how to make molds and patterns with the plastic is given. Bulletin 113 has been announced by Duramic Products Div'n, Technion Design & Mfg. Co., Inc., 262-72 Mott St., New York 12, or —
Circle Inform-A-Gram No. B17.

Special Cam-Making and facilities are discussed in an illustrated booklet. It will be especially interesting to those who require cams with unusual performance characteristics to meet specific application needs. Described also is the service and manufacturing and testing facilities for providing these special cams. Booklet SC-1 is published by The American Cam Co., Inc., P. O. Box 2106, Hartford, Conn., or —
Circle Inform-A-Gram No. B18.

D1-S Grinder on radial drill grinding hard spot on bearing seat.

here's the way to cut costs in hole grinding

...even when needed only a few times per year!

With the Onsrud D1-S Hole Grinder you can do precision grinding in your own shop. Designed for mounting on lathe, milling machine, jig borer or drill. Air turbine motor drive gives ¼ HP, 50,000 RPM grinding speed. A precision built unit throughout with vernier scale for adjustment to 0.0001". For grinding holes up to 2¾" diameter . . . or up to 4" with adapter plate. With the D1-S you can do precision hole grinding in your own shop . . . and control quality to your own standards at considerably lower cost. Experience shows it pays for itself, even when used only a few times a year. For complete information write for Bulletin 1126.

ONSRUD
MACHINE WORKS, INC.
PORTABLE TOOL DIVISION
3941 Palmer Street • Chicago 47, Illinois

Onsrud
D1-S
HOLE GRINDER

CIRCLE INFORM-A-GRAM KEY NO. 151

Plastic Injection Molding Machines are the subject of a brochure. Engineering data and illustrations are presented for the different types of machines which can be used for a variety of molding jobs. No elaborate holding fixtures are required on these machines, molds can be changed in a matter of seconds, and they are self locking. Request copies of this bulletin from Newbury Industries, Inc., Newbury, Ohio, or — **Circle Inform-A-Gram No. B19.**

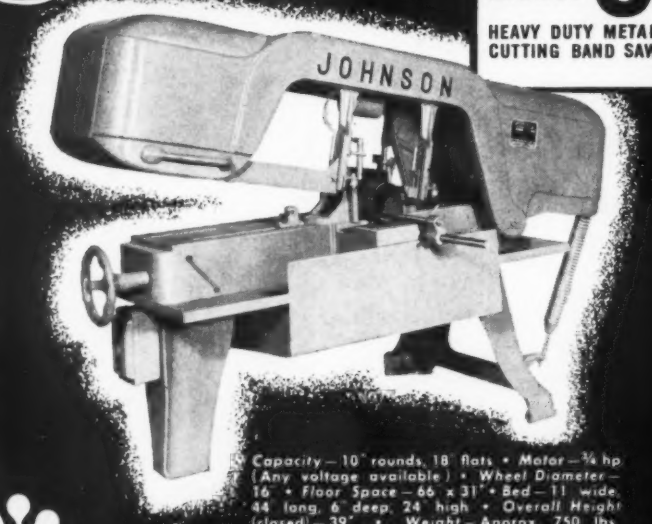
Electro-Probe Electronic Test Indicator, a completely portable dimensional test instrument and the Sure-Set, an electronic table positioning device for universal grinders, are detailed in a bulletin. Operating characteristics of this system are explained and illustrated. Specifications for both systems are included. Bulletin A-580 is prepared by Federal Products Corp., 1144 Eddy St., Providence 1, or — **Circle Inform-A-Gram No. B20.**

COMPARE

and you'll get a BIG NEW

Johnson model J

HEAVY DUTY METAL CUTTING BAND SAW



Capacity — 10" rounds, 18" flats • Motor — ¾ hp (Any voltage available) • Wheel Diameter — 16" • Floor Space — 66" x 31" • Bed — 11" wide, 44" long, 6" deep, 24" high • Overall Height (closed) — 39" • Weight — Approx. 750 lbs. • Speeds — 36, 90, 130, 190 feet per minute.

COMPARE the handsome, husky Johnson Model J with any metal cutting saw and here's what you'll find:

- Johnson leads the way in dependable, well-engineered, high performance band saws.
- A Johnson saw will cut anything in your stock pile, and do it faster.
- Johnson saws contain more exclusive construction and performance features that save time and money.
- Johnson saws are the finest metal cutting machines available anywhere—and, at the lowest price!

COMPARE . . . and see for yourself how easily you can save time, labor and production dollars with a Johnson saw. Complete information, prices — are yours for the asking.

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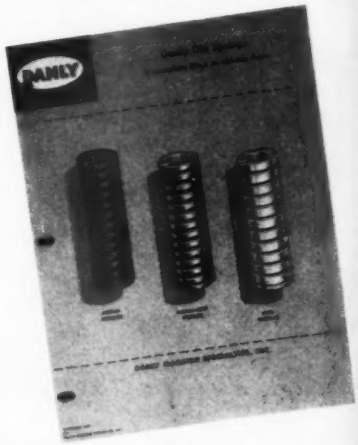
Hale Bldg., 51 Main St.	75 N. Broadway	1605 Solano Avenue
East Orange, N. J.	Des Plaines, Ill.	Berkeley, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 152

Die Springs are now available in three pressures — medium, medium-high, and high. This is one of the features discussed in a bulletin. There are rate charts for spring selection of all types of construction



and pressure. Write to Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill., for a copy of the spring die catalog, or — **Circle Inform-A-Gram No. B21.**

Special Fastener engineering data is provided in an 8-page catalog. Dimensional drawings, specifications, and important features are shown for the Link-Lock, Hinge-Lock, Spring-Lock, Quick-Lock, Roto-Lock, and Dual-Lock. Write to Simmons Fastener Corp., N. Broadway, Albany 1, N. Y., for copies of the bulletin, or — **Circle Inform-A-Gram No. B22.**

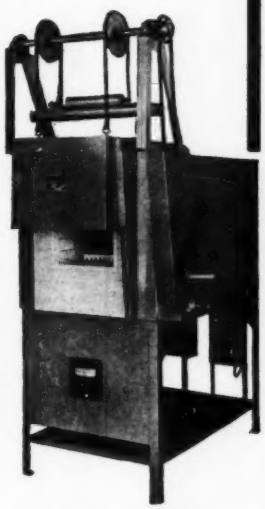
"Whitmore's Lubricants for Plant, Pit & Quarry" is a brochure which gives the type of lubricants for such jobs as open gears, dipper sticks, and cams; enclosed gear cases; hydraulic units; etc. For more information write to The Whitmore Mfg. Co., Cleveland 4, for your copy, or — **Circle Inform-A-Gram No. B23.**

Set-Up Time Is Cut to Seconds with the IMP hold-down vise described in a bulletin. Applications of the vise are illustrated with explanations of the flexibility of the product. For your copy of the bulletin write to Illinois Metal Products, 429 W. Superior St., Chicago 10, or — **Circle Inform-A-Gram No. B24.**

A Concept in Precision Mass Production Finishing is the subject of a bulletin. The Mechanamatic process and equipment is explained and illustrated, and shows how different pieces of equipment can be adapted to fill different requirements. For more information write to Mecha-Finish Corp., Sturgis, Mich., or — **Circle Inform-A-Gram No. B25.**

Designed for Maximum Efficiency
Built in 20 Sizes

HUPPERT
Floor Model
FURNACES



- Continuous operation to 1850° F. — intermittent to 1950° F. — for 2300° F. on special order.
- Complete with indicating electronic controller
- Tight-sealing, wedge-type door
- Standard for 220 V. AC, single or 3 phase operation — 110 V. or 440 V. on special order
- Multi-insulation for maximum efficiency.

Request literature on complete line of Huppert Furnaces

Model No. 16 Illustrated
12" x 8" x 8" $1050.00 complete

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CIRCLE INFORM-A-GRAM KEY NO. 1531

new SCHERR
TOOLMAKERS MICROSCOPE

WITH INTERCHANGEABLE DIAL TEMPLETS AND OCULARS

57
58
59
Reading Angles in Minutes
Thread Templets for U. S. National Thread Profiles-6-80 Pitch. Radii Templets, etc.
LARGE MICROMETER DRUMS READ DIRECTLY IN .0001"
Measuring Range 2" x 1-1/2" and other sizes
A moderately priced PRECISION MEASURING TOOL for Toolroom and Inspection
ACCURACY

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CIRCLE INFORM-A-GRAM KEY NO. 1532

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON
MULTI-FLUTE
BALL END MILLS

- These ball end mills for use on automatically controlled duplicating equipment are now available in 32 stock sizes. They are also for use on conventional milling or die sinking machines.

Weldon standard holders accommodate all sizes.

For complete listing of sizes write or phone your nearest Weldon dealer for circular number KM-1

THE WELDON TOOL COMPANY
3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1533

Find Out How Tool Hardeners Eliminate Finish Grinding

Your high speed steel tools will harden in the Sentry furnace completely protected by the truly neutral Sentry Diamond Block Atmosphere. Tools come from the high heat completely free from scale or decarburization with all sharp edges maintained exactly as before hardening. Finish grinding operations are reduced to a minimum — often completely eliminated.

Elimination of finish grinding is only one of the advantages you get with Sentry equipment. Consult our catalog as your guide to better heat treatment . . . the *best* answer to your tool hardening problem.

584-7

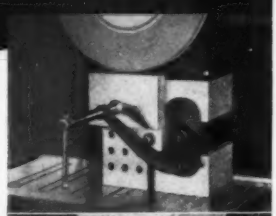
Sentry ELECTRIC FURNACES

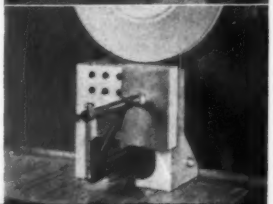
TRADEMARK

Request Catalog A57 • Write THE SENTRY CO., FOXBORO, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1541

NEW Federal Square Master ANGLE PLATE





Will Grind A Work Piece Square The Easy Way Without Skilled Help

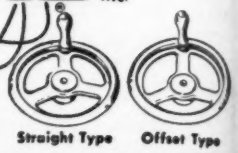
Designed for grinding a work piece to exact squareness, whether it be a component of a jig, fixture, gauge, or die; eliminating an indicator, precision square, surface plate, and use of top skilled help on routine jobs. Can also be used on layout work and inspection. This precision tool is built of high grade steel, stabilized, hardened and ground. ALL WORKING SURFACES ARE GUARANTEED TO BE SQUARE within two-tenths of a thousandth . . . (.0002). Write for complete literature describing other outstanding features.

Note adjustable set edge and recess for C-clamp. ➔

FEDERAL MACHINE TOOL COMPANY, EMMETT STREET, BRISTOL, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 1542

Tomco INC.



HAND WHEELS Straight Type Offset Type

SPECIALS

- HAND KNOBS
- MACHINE HANDLES
- HANDLES
- BALL HANDLES
- LEVERS
- SPECIALTIES

GRADUATED DIALS

SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

WRITE FOR INFORMATION

Tomco INC.
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CIRCLE INFORM-A-GRAM KEY NO. 1543

How To Get Things Done Better And Faster

BOARDMASTER VISUAL CONTROL

- ☆ Gives Graphic Picture—Saves Time, Saves Money, Prevents Errors
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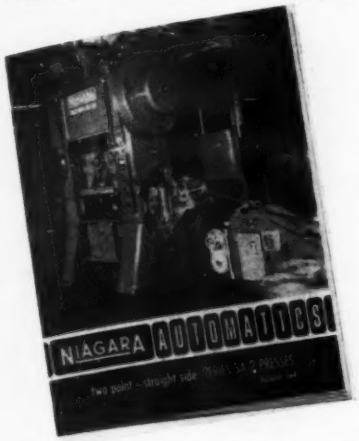
CIRCLE INFORM-A-GRAM KEY NO. 1544

Automatic Coil Feed plus the latest press-mounted controls and devices are features of the Series SA-2, two-point, straight-side automatic presses described in a bulletin. The compre-



hensive bulletin lists complete specifications and dimensions in chart form. Bulletin 264 is available from Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y., or—**Circle Inform-A-Gram No. B26.**

Precision Radial Drills are presented in a bulletin which gives advantages, specifications, and a list of important points of the machines. One of the features is the convenient working height of 26". For more information write to Veet Industries, 25753 Groesbeck Hwy, E. Detroit, Mich., for a copy of the bulletin, or — **Circle Inform-A-Gram No. B27.**

Technical Properties of Masking Tapes and various industrial applications for them are described in a revised brochure. Tensile strength, adhesion, and percentage of stretch are given for 13 masking tapes. Minnesota Mining and Mfg. Co., 900 Bush St., St. Paul 6, supplies copies of the bulletin, or — **Circle No. B28.**

Heat Treating Units are discussed and illustrated in a brochure from Ipsen Industries, Inc., 721 S. Main St., Rockford, Ill. Design and construction features discussed include alloyed ceramic heating tubes, Ipsen flame-busters, single-piece cast fan and shaft, etc. Write to the company for copies of this bulletin, or — **B29.**

Completely Automatic Operation for standard turret lathes is described in a 4-page illustrated folder. Ram and cross-slide travel ranges for these lathes equipped with Lynn hydraulic drives are also included. Contact Jones & Lamson Machine Co., Springfield, Vt., for copies of the bulletin, or — **Circle No. B30.**

Firthaloy Dies and Die Finishing Machinery and Diecarb perforators are discussed in a catalog. Square and hexagon shape drawing dies; round wire, bar, and tube drawing dies; rough mandrel nibs; rough cored heading die nibs, etc. are among those covered. Detailed diagrams are provided in addition to a list of specifications. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, supplies copies of Bulletin FDM-57, or—**Circle Inform-A-Gram No. B31.**

Convey and Process Production Parts with one of a wide range of wire parts-handling baskets explained in a bulletin. Also shown are conveyor hooks, plating racks, and many special purpose materials handling items. Wire machinery guards, conveyor catch guards, and other safety products are included. Bulletin MS-57 is available from Wire and Iron Products Inc., 1725 16th St., Detroit 16, or — **Circle Inform-A-Gram No. B32.**

Costs go *DOWN*

...with New *ROTATING* Drill Heads and Tapping Heads by WISCONSIN

Custom designed and built to fit all types of Automatic Lathes and Chucking Machines.
Wisconsin Rotating Drill Head with planetary gear drive.

Adjustable and Fixed Spindle Drill Heads and Tapping Heads, Lead Screw Tapping Units, Special Machines, Fixtures, Fixture Bases, Index Tables. Write for literature.

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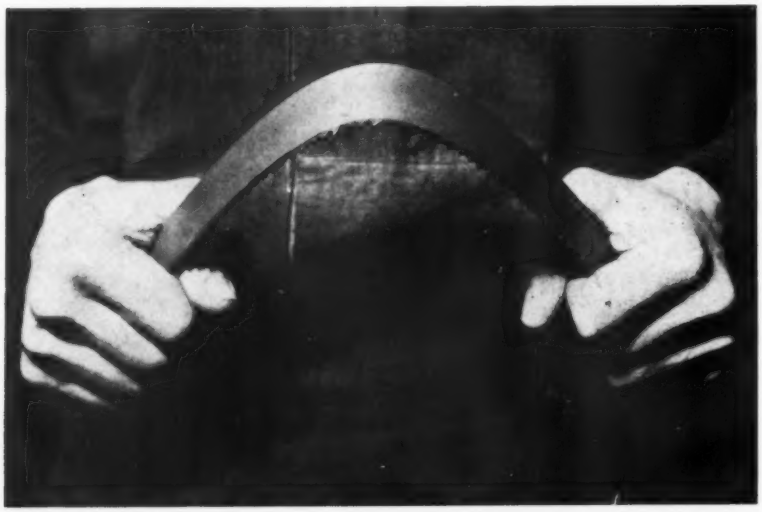
CIRCLE INFORM-A-GRAM KEY NO. 155

"Indicating Gages" is the title of a bulletin published by Acra-Ment Instrument Div'n, Sealol Corp., Post Rd., Providence 5. The bulletin lists models and their ranges, and gives descriptions of the type of work each is produced for. Included is information on snap gages, medium and large ID and OD gages and set masters, bench comparators, and several specially designed and built gages. Write to the company for the bulletin, or — **Circle No. B33.**

Use Shear-Flex Mounting Pads for an easy, efficient, and economical way to eliminate lagging to floor and reduce noise and vibration transmission. A bulletin shows how these pads are fitted under the leg or bearing plate of the machine. An information table gives the type of Flex-Plates, size, and other dimensions. Copies of Bulletin PT-10 are prepared by Vibration Mountings, Inc., 98-15 50th Ave., Corona 68, N. Y. **Circle Inform-A-Gram No. B34.**



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With a MARVEL Blade, you can cut any material—from the free machining steels to the toughest alloys . . . fast, accurately and economically.

You can tension a MARVEL Blade from 200% to 300% tauter than any ordinary blade, permitting much higher speeds and heavier feeds without deflection or breakage.

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CIRCLE INFORM-A-GRAM KEY NO. 156

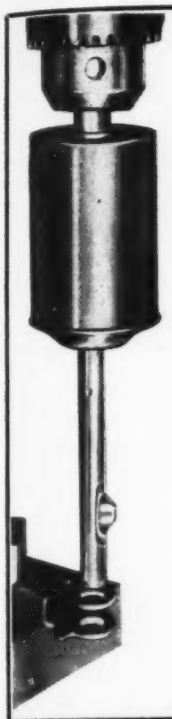
Tracer-Controlled Sculpture Machines are described in a bulletin available from Colonial-Romulus Div'n, Colonial Broach and Machine Co., Parkgrove Station, Detroit 5.

The bulletin gives specifications and features of these hydraulically driven machines. Application photos show uses of the machine in different industries. Write to the company for copies of Bulletin CRS-57, or — **Circle Inform-A-Gram No. B35.**

Powdered Metal Parts are discussed in a bulletin from Chicago Powdered Metal Products Co., 9700 Waverland Ave., Schiller Park, Ill. One of the features of the bulletin is a 300-ton molding press which can mold parts up to 15 sq in and 5" thick. A chart of physical characteristics of standard Camet materials is also included. Obtain copies of the bulletin from the company, or — **Circle Inform-A-Gram No. B36.**

Cutting-Off Machines and Automatic Loaders are highlighted in a catalog. Capacities, spindle speeds, motors, weights, and other specifications are given. Included is an explanation of the cycle of operations and the basic components of the machines. For more information write to Modern Machine Tool Co., 2005 Losey St., Jackson, Mich., for a copy of this catalog, or — **Circle Inform-A-Gram No. B37.**

250 Styles and Sizes of extension arbors are among the tools listed in a bulletin which also includes dimensional data for tapered shank collet chucks. Also described are self-removing wheel holders for all types and makes of tool and cutter grinders, vertical, cylindrical, and surface grinders. Write to Pope Machinery Corp., Haverhill, Mass., for Bulletin WA-10, or — **Circle Inform-A-Gram No. B38.**



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THE NOBURMATIC "HA" TOOL DEBURRS FRONT AND BACK FACES OF HOLES IN A SINGLE ACTION.

Retractable cutter functions automatically upon contact with the work-piece. Action is *positive* and *measured* — assuring quality and consistency of performance unmatched by any spring operative device. Operative-head receives all pilot sizes interchangeably.

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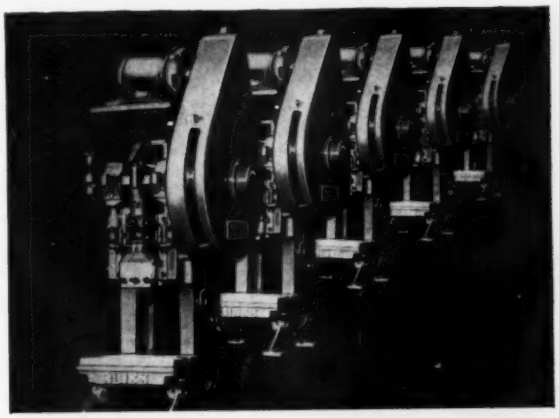

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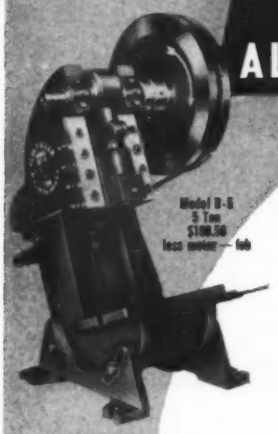

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Powerful
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164 Different Model Combinations 1 to 5 Ton Capacities

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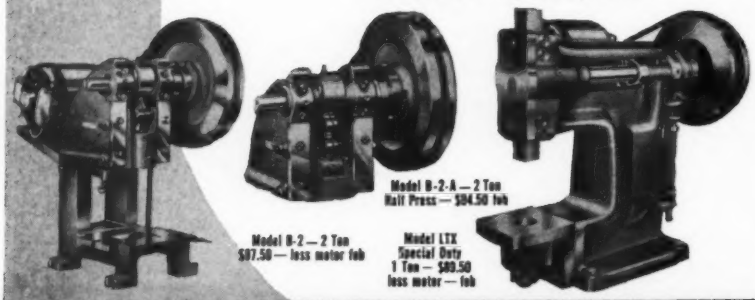

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Fast! Accurate! Easy!

This compact machine tests spotwelds, strip, wire, anything within its 20,000 lb. capacity. Hydraulically powered, it has an easily controlled ram, self-acting specimen grips that are open sided for easy specimen insertion. This tester, Model ST-1, is adjustable to take specimens 5″ to 9″ in length. Various load gauges, grips, and other modifications are available.

Write for more information — give us your requirements.

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KEYWAYS
— ACCURATE and UNIFORM with
The GLENNY
Adjustable Expansion
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this sturdy simple tool can be used on any type arbor press for continuous efficient keyways — in any quantity

COSTS OFTEN REDUCED AS MUCH AS 10 TIMES

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HUNDREDS OF PIECES TO A .0003 TOLERANCE WITH THIS HARDENED VISE STOP THAT IS ADJUSTABLE IN ALL DIRECTIONS. ATTACH TO VISE WITH ONE ¼—20 TAPED HOLE.

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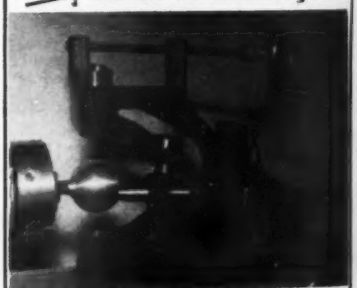

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The accurate short cut for turning any radius. Adaptable to most any lathe. Contact your tool supplier or write for details.

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CIRCLE INFORM-A-GRAM KEY NO. 1585

Minster Clutch Conversion Bulletin CC57 discusses the features of the air friction clutch and brake for reconditioning and modernizing existing mechanical presses. Reasons why increased production and reduced maintenance is a result of clutch conversion are shown by actual press conversion installations. Direct requests of this bulletin to The Minster Machine Co., Minster, Ohio, or — **Circle Inform-A-Gram No. B39.**

Automatic-Return Cylinders are described in a bulletin which illustrates and discusses the different models. Specifications and detailed drawings are included. A feature of the cylinders is the return-controlling units, now an integral part of the cylinder heads. Copies of the bulletin are available from The A. K. Allen Co., Inc., 255 E. 2nd St., Mineola, N. Y., or — **Circle No. B40.**

Precision, High Production Boring, facing, chamfering, turning, and grooving operations can be done with the boring machine highlighted in a bulletin. Detailed drawings show all angles of the machines and a list of specifications is included. Copies of the bulletin on the Model 30-012 boring machine can be obtained from The Olofsson Corp., 2727 Lyons Ave., Lansing, Mich., or — **Circle Inform-A-Gram No. B41.**

Die Springs are the subject of a catalog which classifies them in 500 standard sizes and three distinct pressure groups for each size. Full specifications are given in chart form and included are descriptions of Dieco's packaged spring assortments. For a copy, write to E. W. Bliss Co., Cleveland, for Catalog 70-A, Section 4, or — **Circle No. B42.**

Hydraulic Presses are presented in an illustrated bulletin which describes the features of these precision steel presses. A list of specifications includes capacities, platen dimensions, and length of stroke. A. Dale Herman, Inc., 17071 Ventura Blvd., Encino, Calif., supplies copies of the bulletin, or — **Circle No. B43.**

Gear Production Equipment and broaching tools are presented in a 24-page bulletin. Included in the catalog are a general capacity table and descriptions of rotary shaving machines for internal and external spur and helical gears up to 200" capacity. Catalog AP57-11 is prepared by National Broach & Machine Co., 5600 St. Jean, Detroit 13, or — **Circle Inform-A-Gram No. B44.**

Use Quick Change Holders on milling machines, boring mills, radial drills, turret lathes, etc. A revised bulletin describing these holders includes dimensions and detailed drawings for each type of holder and directions for attaching them. Write to Erickson Tool Co., 34350 Solon Rd., Solon, Ohio for your copy of this bulletin, or — **Circle Inform-A-Gram No. B45.**

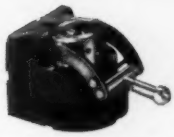
Standard Bar and Barrel-Type Flush Pin Gages, dial indicator gage housings, and indicator depth gages are offered in a bulletin. The 3/8" adjustment range dial indicator gage unit is fully described, and pictured. This bulletin has been announced by Rite-O-Tool & Gage Co., 321 W. Ten Mile Rd., Hazel Park, Mich., or — **Circle Inform-A-Gram No. B46.**

16" and 18" Lathes for high production, tool room, or maintenance work are highlighted in a brochure. The machines are completely described and particular attention is paid to several of the featured parts, Specifications for the machines are also given. Direct requests of Bulletin 904 to Rockford Machine Tool Co., Rockford, Ill., or — **Circle Inform-A-Gram No. B47.**

GET A HOLD ON YOUR WORK

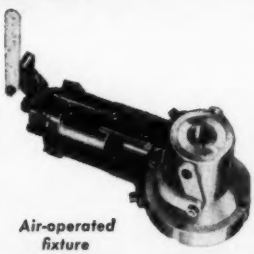
Holding-indexing fixture

Holding fixture



Vertical-horizontal fixture

USE ZAGAR COLLET FIXTURES



Air-operated fixture

Collet lathe chuck

The most Effective, Economical, Efficient devices for accurate production

Successful and profit-making for over 15 years, Zagar holding and indexing fixtures step up production and cut your costs. They are *effective* because they hold work rigidly, firmly. They are *economical* because first cost is low, and much costly special tooling can be eliminated. They are *efficient* because set-up is speeded and small part production is a natural. Slot mill, straddle mill, drill, tap, and grind small pieces simply, quickly, and profitably with one of many Zagar collet fixtures—available from stock.

Write for Engineering Data Sheets "T-2".

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TOOLS FOR INDUSTRY and SPECIAL MACHINERY

15 Types of Machinery Mountings which utilize steel springs, rubber, and cork, either singly or in combination, are itemized in a bulletin. It shows installation photos of a variety of equipment and provides a chart for selection. Bulletin K4D is released by The Korfund Co., Inc., 48-39E 32nd Place, Long Island City 1, N. Y., or — **Circle No. B48.**

High Speed Precision Flexopresses, both "C" type and straight side, are outlined in an 8-page bulletin. Complete specifications of the "C" type from 15- to 75-tons and the straight side from 75- to 200-tons are included. For copies of the Bulletin AFP-101, write to The Precision Welder & Flexopress Corp., 3520 Ibsen, Cincinnati, or — **Circle No. B49.**

Accurate Three Dimensional Measurements of irregularly shaped objects, such as models, prototypes, tools, etc., can be accomplished with lightweight tooling bridge equipment outlined in a bulletin. Dimensions and features are discussed, also. Direct requests for copies to The Challenge Machinery Co., Grand Haven, Mich., or — **Circle No. B50.**

from **to** **in 9 seconds**

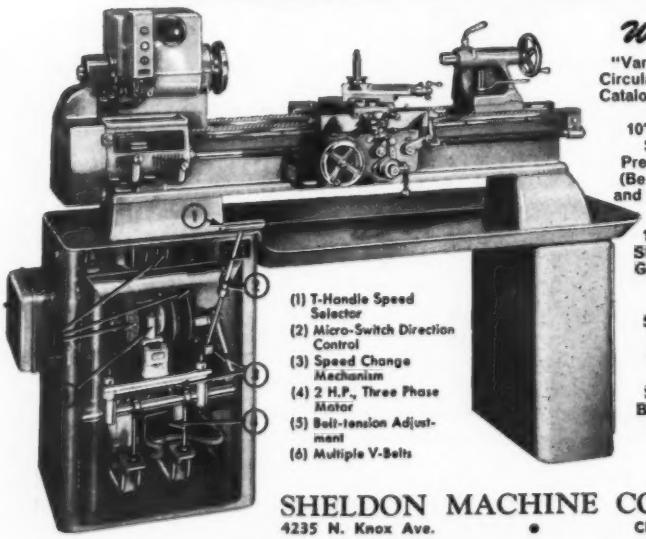
or to *any* intermediate speed, *instantly*

Just raise or lower the T-handle control, and watch the large tachometer dial in the headstock! It's that easy! The work is done by a power driven speed changer. It accelerates or slows the lathe to any desired speed in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds —200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe, moderate in price, with the versatility for toolroom, production or second operation jobs.

SHELDON *Variable Speed* **PRECISION LATHES**


(1) T-Handle Speed Selector
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(4) 2 H.P., Three Phase Motor
(5) Belt-Tension Adjustment
(6) Multiple V-Belts

Write for
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10", 11" and 13" SHELDON Precision Lathes (Bench, Pedestal and Cabinet types)
•
13" and 15" SEBASTIAN Geared Head Lathes
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SHELDON MACHINE CO., INC.
4235 N. Knox Ave. • Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 160

Time-Saving Inspection and Set-Ups can be accomplished with the magnetic base tools and accessories illustrated in a bulletin. It describes the Magnicator Junior, a line of magnetic base tools in two sizes, with a variety of accessory lights, magnifiers, and dial indicators. Dimensions and advantages are included. Bulletin M59 is released by Brown & Sharpe Mfg. Co., Providence, or — **Circle Inform-A-Gram No. B51.**

Uses of Electrolytic Grinding are listed and explained in a bulletin. They include the grinding of extremely hard materials, temperature sensitive materials, and materials which are subject to burrs and layover when ground conventionally. Bulletin 115, "Anocut Electrolytic Grinding," is published by Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6, or—**Circle No. B52.**

Low Cost 100%-Reactive Elastomer-Phenolic Film Adhesives for the flat-surface bonding of all metals and plastics are highlighted in a bulletin. Included are several pages outlining the generic advantages of dry, solvent-free film adhesives. Request copies of the Plymaster V-2 and V-3 bulletin from Rubber & Asbestos Corp., Dept. P, 225 Belleville Ave., Bloomfield, N. J., or — **B53.**

A Handy Wire Gauge Table is one of the features of a bulletin which describes specialty wire products. Iron and steel wire and non-ferrous wire are discussed and dimensions for the different types of wire are included. Direct requests for copies of the "Prentiss Wire Products" catalog to H. K. Porter Co., Inc., Riverside-Alloy Metal Div'n, Riverside, N. J., or — **Circle No. B54.**

Six Different Basic Types of Mills suitable for use on a wide range of tool room, job shop, and high production work are among the line highlighted in a bulletin. Condensed specifications are provided for each milling machine shown. Write to U. S. Burke Machine Tool Div'n, Brotherton Rd. at Pennsylvania RR, Cincinnati 27, for a copy of this bulletin, or — **Circle No. B55.**

Force Control Switches designed for controlling mechanical forces electrically are outlined in a bulletin. Available in six capacities, these instruments can control forces at countless load points and are furnished with from one to four adjustable switches. Copies of the bulletin are published by W. C. Dillon & Co., Inc., 14620 Keswick St., Van Nuys, Calif., or — **Circle No. B56.**

PRODUCTIVE

PRODUCTO FOOT PRESSES

These sturdily constructed, bench-type presses are ideal for novelty and small stamping or assembly operations. Available in two sizes, both with high output to input ratio. Write for detailed specification sheets.

THE PRODUCTO MACHINE CO.
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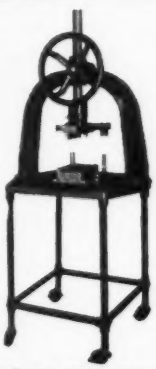

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Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the die-maker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

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CUT COSTS THRU GAGE SALVAGE

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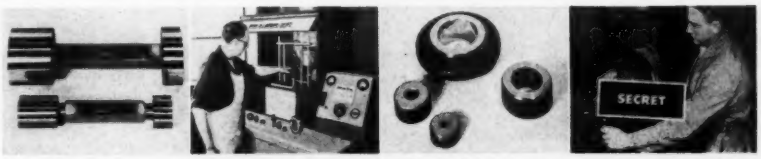
Get better than new gage life with Ritoloy!

Rite-O offers you two superior wearing surfaces when salvaging your gages. After reworking and grinding, they can be chrome plated or resurfaced with Ritoloy, the exclusive Rite-O nickel alloy that wears like carbide. After finish grinding they are precision lapped, just like our new Micro-Lap gages. You get chrome gages at much less than the cost of new ones, and Ritoloy gages at far less cost than new carbide gages. Send your worn gages for a quotation today.



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Precision manufacturers of plain and threaded plug and ring gages, indicator depth gages, and special gages and fixtures

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Diamond Dust Collector and Controlled Coolant System

Easily converts your universal Tool Grinders to wet operation and collects diamond swarf separately for salvage.

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- Improved tool finish and longer life
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Package Unit furnished complete with universally adjusted hood.

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Supplied in one Superior Accuracy
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82 BLOCK SET ..... $260.00 IN CASE

These sets will supply the needs of any discriminating shop that must work to gage-block precision. IMMEDIATE DELIVERY

9 Block Set
For Individual Mechanic
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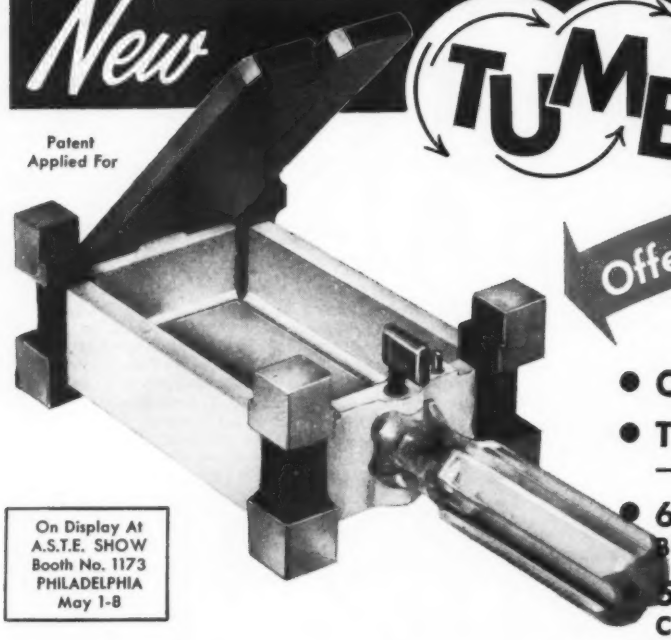
New TUMBLE BOX JIG

Patent Applied For



Offers Many Big Advantages

AVAILABLE IN **47** SIZES

- **ONE-HALF THE WEIGHT**
- **TRI-METAL CONSTRUCTION** —ALUMINUM—CAST IRON—STEEL
- **6-SIDE UTILITY**—CAN USE HEAD-TYPE BUSHINGS, ON SIDES, TOP, BOTTOM
- **5 HANDLE LOCATIONS**—HANDLE CAN BE ATTACHED TO ANY SIDE OR BOTTOM
- **ONE HAND OPERATION**—THUMB SCREW RELEASES LID INSTANTLY
- **LEAF "POP-UP"**—AUTOMATIC ACTION SPRING PLUNGER SNAPS LID OPEN
- **STABLE**—RUGGED CONSTRUCTION

On Display At A.S.T.E. SHOW Booth No. 1173 PHILADELPHIA May 1-8

Standard Parts is First with Exclusive New "TUMBLE" Jig

Light Weight and Ease of Handling Boost Production, Cut Operator Fatigue

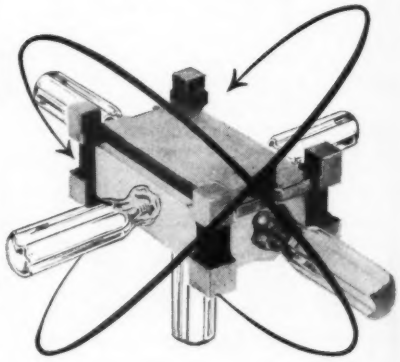
New design features, new engineering concepts, new construction techniques . . . . are incorporated in this outstanding line of "Tumble" Box Jigs. By combining 3 metals—aluminum, cast iron, steel—half the weight has been eliminated. This increases efficiency and production. The sturdy handle (can be located on any side) makes tumbling fast, easy and safe.

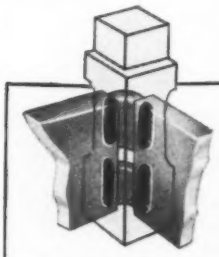
Bushings can be used on all 6 sides. A unique interlocking feature is the aluminum through the cast iron legs, which assures strength and stability. Walls can easily be machined without distorting the Jig. 47 Sizes available 1" x 1" x 1" to 4" x 8" x 4".

Full size Tracing Templates are available for all 47 sizes.

HANDLE (as illustrated) may easily be attached on any side or bottom of the jig as needed.

TUMBLE—Universal tumble direction (as illustrated) is advantage of this lightweight jig — where handle can be located where desired.





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4	23	41	59	106	138	171	1192	1284	1392	1463	1581	1695	1784
5	24	42	61	107	141	173	1193	1285	1393	1491	1582	1701	
6	25	43	82	108	142	175	1194	1311	1394	1492	1583	1702	
7	26	44	63	111	144	179	1201	1312	1395	1493	1584	1703	
8	27	45	64	113	147	180	1202	1313	1401	1501	1585	1704	
9	28	46	66	115	148	1091	1203	1321	1402	1502	1611	1721	
10	29	47	93	117	151	1092	1204	1322	1403	1503	1612	1722	
11	30	48	94	118	152	1093	1231	1323	1404	1531	1613	1723	
12	31	49	95	121	155	1094	1232	1324	1431	1532	1614	1724	
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15	33	51	97	125	159	1142	1234	1352	1433	1541	1616	1741	
16	34	52	98	126	160	1143	1241	1353	1434	1542	1651	1742	
17	34A	53	99	127	162	1144	1242	1354	1451	1543	1652	1771	
18	35	54	101	129	163	1161	1243	1361	1452	1544	1653	1772	
19	37	55	102	130	164	1162	1244	1362	1453	1571	1691	1773	
20	38	56	103	133	166	1163	1281	1363	1454	1572	1692	1781	

EDITORIAL ITEMS

A1	A19	A37	A55	A73	B8	B26	B44	B62
A2	A20	A38	A56	A74	B9	B27	B45	C1
A3	A21	A39	A57	A75	B10	B28	B46	C2
A4	A22	A40	A58	A76	B11	B29	B47	C3
A5	A23	A41	A59	A77	B12	B30	B48	C4
A6	A24	A42	A60	A78	B13	B31	B49	C5
A7	A25	A43	A61	A79	B14	B32	B50	C6
A8	A26	A44	A62	A80	B15	B33	B51	C7
A9	A27	A45	A63	A81	B16	B34	B52	C8
A10	A28	A46	A64	A82	B17	B35	B53	C9
A11	A29	A47	A65	A83	B18	B38	B54	C10
A12	A30	A48	A66	B1	B19	B37	B55	C11
A13	A31	A49	A67	B2	B20	B38	B56	
A14	A32	A50	A68	B3	B21	B39	B57	
A15	A33	A51	A69	B4	B22	B40	B58	
A16	A34	A52	A70	B5	B23	B41	B59	
A17	A35	A53	A71	B6	B24	B42	B60	
A18	A36	A54	A72	B7	B25	B43	B61	

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A9	A27	A45	A63	A81	B16	B34	B52	C8
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A11	A29	A47	A65	A83	B18	B36	B54	C10
A12	A30	A48	A66	B1	B19	B37	B55	C11
A13	A31	A49	A67	B2	B20	B38	B56	
A14	A32	A50	A68	B3	B21	B39	B57	
A15	A33	A51	A69	B4	B22	B40	B58	
A16	A34	A52	A70	B5	B23	B41	B59	
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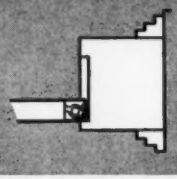

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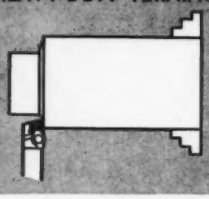

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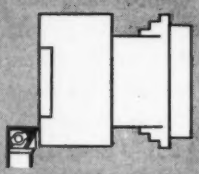

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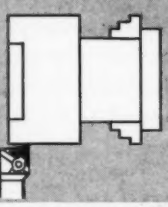

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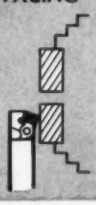
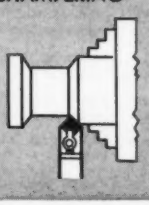
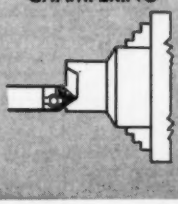


STYLE **SET** CHAMFERING



STYLE **TDTR** CHAMFERING



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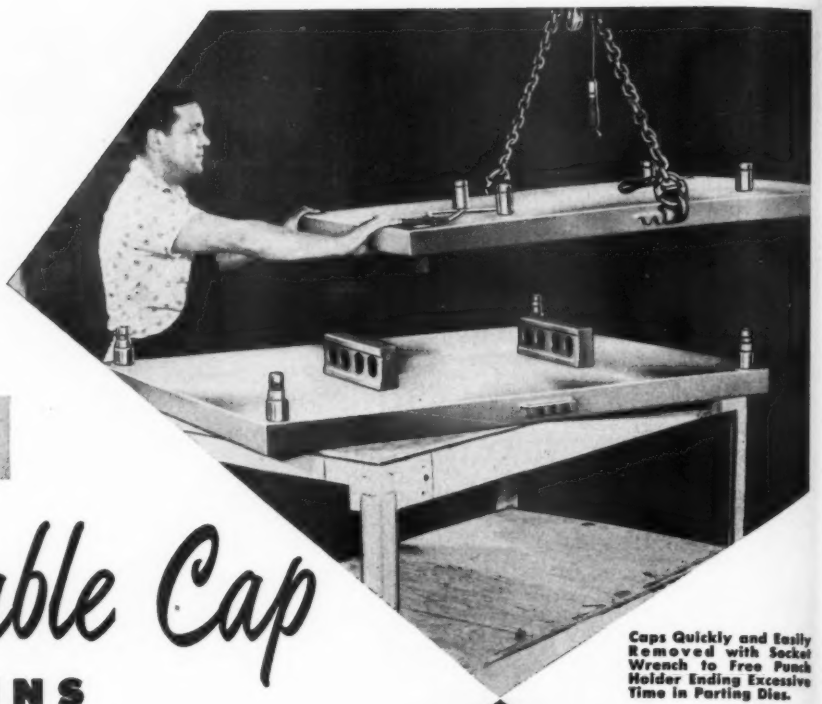

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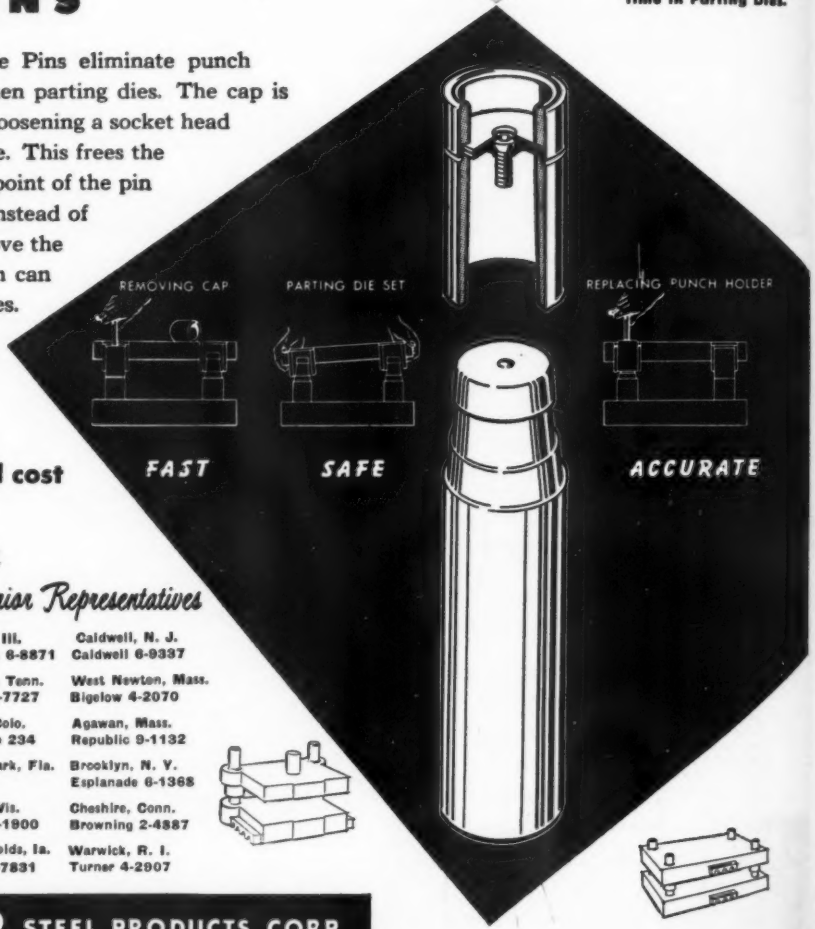

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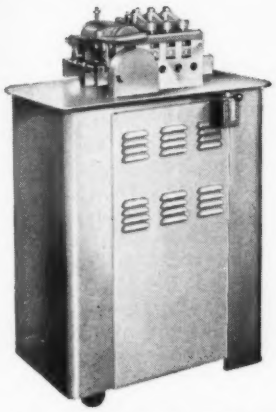
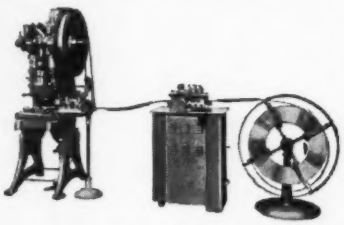
FLEXIBILITY
in Stock Straightening



WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

Production Feeding Equipment

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Simplify Tapping in Hard-to-Reach Spots with the Mag-Tool magnetic tapper. One of the features outlined in a bulletin is that it attaches in any position to ferrous surfaces. It also prevents tap breakage and operates in any position without loss of accuracy. Request copies of the bulletin from Magnetic Tool Corp., 1955 Lafayette St., Santa Clara, Calif., or — **Circle No. B57.**

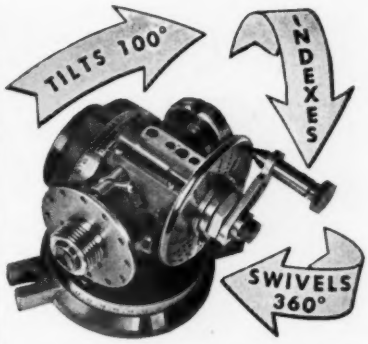
A FlexAngle Universal Slotted Angle System is the subject of a catalog which describes the features of FlexAngle and suggests a few of its many uses. Varied applications are pictured along with the illustrations of 30 basic joint designs and line drawings of section combinations. For copies of the catalog write to FlexAngle Corp., 278 Park Rd., W. Hartford 7, Conn., or — **Circle B58.**

For Precision Inspection, Layout, and Measurement use the fast, easy, and accurate gages discussed in a bulletin. Several models are described and illustrated, in addition to an explanation of the type of work for which they are best suited. Pacific Gage, Inc., Div'n of Darco Industries, Inc., 2151 E. Rosecrans Ave., El Segundo, Calif., publishes the bulletin, or — **Circle No. B59.**

A Combination Microscope, projector, comparator, and camera is highlighted in a bulletin. The Projectina is fully described, and specifications and technical details as well as detailed drawings are included. The uses of this machine and the attachments are listed. Write to Alfred Hofmann & Co., 629-635 59th St., West New York, N. J., for a copy of this bulletin, or — **Circle No. B60.**

28-Oz Capacity is one of the features of the "400" plastics injection molding machine. A new bulletin on this machine details platen and die head dimensions, automatic induction pressure reduction, plug-in electric components, and automatic lubrication. Bulletin 4001 is compiled by National Automatic Tool Co., Inc., Richmond, Ind., or — **Circle Inform-A-Gram No. B61.**

Double-Enveloping Worm Gearing is presented in a bulletin which contains detailed engineering formulae and step-by-step instructions for using them in designing and applying Cone-Drive gearing to drives of all types. Bulletin CD-200 is available from Cone-Drive Gears Div'n., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or — **Circle No. B62.**



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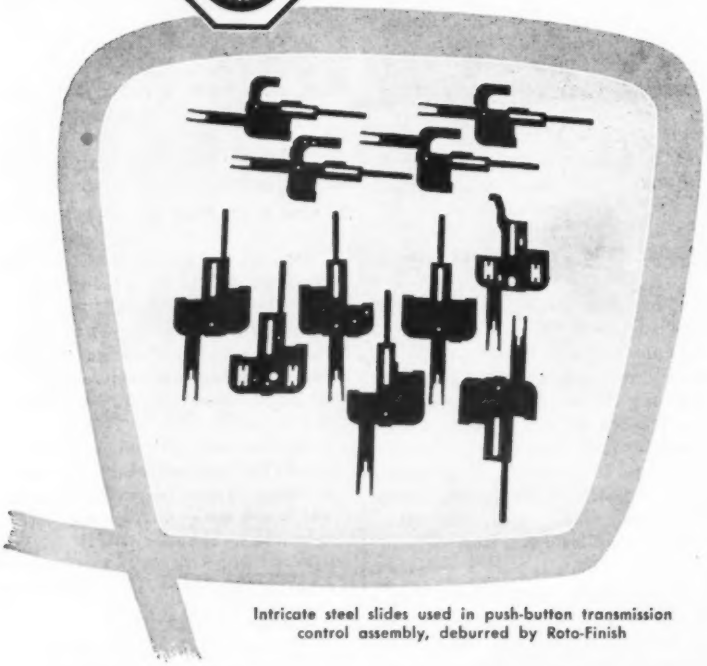
CIRCLE INFORM-A-GRAM KEY NO. 1653

push button driving... and the ROTO FINISH® story behind it...



Intricate steel slides used in push-button transmission control assembly, deburred by Roto-Finish

3000 PIECES PER HOUR DEBURRED AUTOMATICALLY

That's the story of *one Roto-Finish* machine installed in a Detroit automobile plant to deburr push button transmission control slides. All the operator does is load parts into the machine. The balance of the 30 minute cycle is entirely automatic. Man power savings are tremendous!

PROCESSING MATERIAL COSTS FOR 100 PARTS—JUST 2¼¢. The cost of processing materials, both chips and compound, is .0223¢ per piece.

SEND FOR YOUR FREE ROTO-FINISH HANDBOOK

PUT ROTO-FINISH ENGINEERING SKILL AND OUR YEARS OF PROCESSING EXPERIENCE to work for you. In either your plant or our laboratory, our process engineers will prove, *before you buy*, that Roto-Finish provides the finish you want at a lower cost. Phone or write today.

Roto-Finish COMPANY

ROTO FINISH®

3729 MILHAM ROAD, KALAMAZOO, MICH. • PHONE: FIRESIDE 3-5578

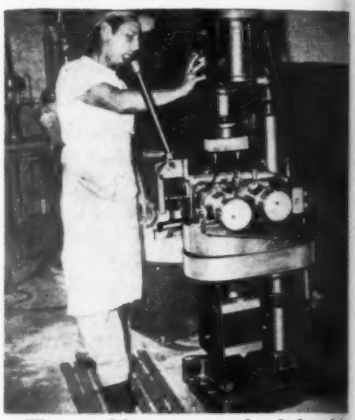
FOREIGN REPRESENTATIVES: ARGENTINA—Taller—Buenos Aires ● AUSTRALIA—A. Flavell Ltd.—Cheltenham ● BRAZIL—Commercial E. Industrial de Fornos Werco, Ltd.—Rio de Janeiro ● CANADA—Canadian Hanson & Van Winkle Co., Ltd.—Toronto ● ENGLAND—Roto-Finish Ltd.—Hemel Hempstead ● FRANCE—Societe Roto-Finish—Paris ● GERMANY, AUSTRIA, NORWAY, SWEDEN, SWITZERLAND—Metallgesellschaft A. G.—Frankfurt, a. M.—Germany ● HOLLAND, BELGIUM, LUXEMBURG—N. V. Roto Finish Maatschappij—Delft, Holland ● ITALY—Societa Roto-Finish a R. L.—Milan ● SPAIN—Instituto Electroquimico, S. A.—Barcelona

CIRCLE INFORM-A-GRAM KEY NO. 166

DRILL UNITS SOLVE A PRODUCTION PROBLEM

When the opportunity to bid on a large production order for missile parts was offered to the Device Manufacturing Company, management made an analysis of their shop equipment. It showed that they could not produce at the speed required.

The specifications for the part called for eight precision holes to be drilled from four sides, but Device did not have enough precision drilling equipment to do the job. They did not have the necessary space to install additional drill presses nor the mechanics to operate them. If conventional drill presses were used, the part would have to be jigged in a heavy fixture. Then it would have to pass through five drill presses in sequence, with a flop-over needed for each drilling operation.



The problem was solved by installing two series 24 Dumore automatic drill units on a drill press post. One was for boring the holes on the topside of the part. The other was for boring upward from underneath. Both the top and the bottom units were equipped with dual drill heads so that each could bore two closely-spaced holes.

A fixture was then installed on the drill press post to mount three Dumore automatic drill heads. Here again one of the drill heads was equipped with a dual drilling arrangement so that two closely-spaced holes could be drilled at one time.

The five drills were synchronized and attached to a single control. When the button is pushed, all five drills driving a total of eight bits bite into the work at the same time. The job is now accomplished in a single operation. This single multiple drill setup accomplishes the work faster and easier than it could be done with five conventional drill presses and five operators.

DIE SETS on the ROCKS?

It'll never happen if you specify Detroit Die Sets

Detroit DIE SET CORPORATION

Offices in Principal Industrial Centers

You can have a free copy of our 60-page catalog by asking for it. Details over 2000 stock precision and commercial die sets—plus accessories.

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 167

The promotion of **Kenneth E. McKown** to assistant manager, Steel Sales Division, has been made known by Firth Sterling Inc.

◆

Direct salesman in New England for the Cutter Division of The Ingersoll Milling Machine Co. is **Don T. McLennon.**

The Aro Equipment Corp. has appointed **John E. Rowe** as area representative for Maryland and the District of Columbia. In the Chicago, northern Illinois, and Wisconsin area, **Philip J. Sweenie** takes over as sales representative. He will be responsible for sales of the company's industrial lubrication equipment to original equipment manufacturers.

◆

Latrobe Steel Co. has announced that **Howard M. Givens** has been named vice president of sales and **W. G. Dahl** has been appointed general sales manager.

Earle E. Boyer serves as district manager of the newly established Cleveland district for Kennametal Inc. **Thomas J. Kniff** is district manager of the Detroit district, which replaces the central district. **Robert M. McCray** has been appointed district manager for the Cincinnati area, replacing **George J. Raible** who has retired. Die sales coordinator for the company is **William F. Gearhart.**

◆

Appointment of **Lester V. LeRoy** to the sales staff of Cargill Detroit Corp. has been revealed. He will represent the company in Michigan.

◆

Joseph A. Boothroyd, Jr., has taken over as sales representative for the Size Control Co.

◆

William H. McCarty, Jr., has been appointed district manager for Latrobe Steel Company's sales and sales-engineering work, with headquarters in Boston.

◆

Russell L. Kavanaugh has taken over as sales and engineering representative in the Indiana, southwestern Michigan area for the Michigan Tool Co. He will represent the complete line of machine tools, cutters, and checking devices. South Bend, Ind., will be his headquarters.

◆

Zagar Inc. has opened a Detroit office, with **Charles M. Powers** as district manager.

◆

John R. Keates has been appointed general sales manager of the Machine Tool Division of National Automatic Tool Co., Inc.

◆

Vice president in charge of domestic press sales for Clearing Machine Corp., division of U. S. Industries, is **Ervin J. Baumrucker. Eugene P. Cunningham** takes over as vice president in charge of sales and administration for the division.

◆

Recent changes in The Lincoln Electric Company's district offices have **Bruce N. Frye** transferring to Columbus; **Edwin Williams,** to Birmingham, Ala.; and **Gerald R. Stoeckinger** joining the district office in Los Angeles.

◆

Manco Products, Inc. has named **Gordon E. Chase** district sales manager covering Ohio, Indiana, New York, and western Pennsylvania, with headquarters in Buffalo.

◆

New west coast representative for Lake Erie Machinery Corp. is **Archie J. Smith.** He will have offices in Van Nuys, Calif.

ACE
Ground-from-the-Solid
DRILLS

Whatever you want to drill – steel, cast iron, or non-ferrous materials – you'll find there's an ACE "Ground-from-the-Solid" Drill that's pointed *right* for the job! Drills made of top quality, uniformly hardened high speed steel –carbide tipped and solid carbide, too. Drills ground by the ACE-originated method that gives them more highly polished flutes and keener, stronger, longer-lasting cutting edges. Drills that are finished with on center points, correct point angle and lip relief to "bite" in fast, produce cleaner, more accurate holes. And they're available *now* through your local distributor – *so ask for them by name!*

Call your local distributor or write direct today for the latest Ace Drill Catalog and current Net Price Schedule.

ACE DRILL
ADRIAN, MICHIGAN
Originators of Ground-from-the-Solid High Speed Steel Drills

Taper Length Drills	Stub Length Drills	"Hi-Brinell" Drills	Carbide Tipped Drills
12"-18" Longboy Drills	Heavy Duty Drills	Solid Carbide Drills	Step and Subland Drills
Hardened H.S.S. Blanks	Slow Spiral Drills	Taper Shank Drills	"L" and "M" Plastic Drills
General Purpose Drills	Fast Spiral Drills	Chucking Reamers	Drill Length Reamers

CIRCLE INFORM-A-GRAM KEY NO. 168

PALMGREN

GET THIS FREE CATALOG on Work Holding Tools NOW!

Used in all industries . . . everywhere

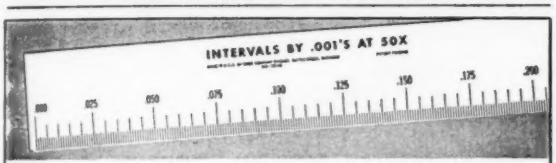
This catalog shows the most complete line of work holding tools available anywhere for production on milling machines and drill presses . . . angle vises . . . drill press vises . . . swivel machine vises . . . adjustable angle plates with or without swivel bases . . . production vises . . . heavy duty angle vises . . . rotary and indexing tables for use on milling machines and drill presses . . . milling attachments for milling on lathes.

There are 68 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories, with jaw sizes from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today, showing the complete line, details and prices.

125

CHICAGO TOOL and ENGINEERING CO.
8388 SOUTH CHICAGO AVE. • CHICAGO 17, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1691



Gage Company **PRECISION PLASTIC**
COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

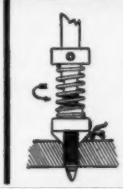
WRITE FOR BULLETIN NO. 54-1511

GAGE COMPANY
BATTLE CREEK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1692

TAP AND DEBURR IN ONE OPERATION

Slip a BURR-BIT onto any make tap and holes are automatically deburred while they are being tapped. Save money, time and labor by COMBINING TWO OPERATIONS INTO ONE.



AS TAP IS WITHDRAWN, DEBURRS, LEAVING CLEAN CHAMFER

First thread which creates burr, has been AUTOMATICALLY, QUICKLY AND PRECISELY REMOVED, leaving perfectly smooth finish for easy screw insertion.

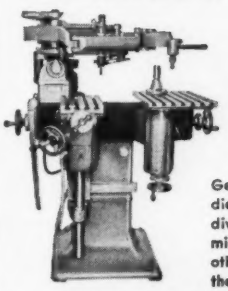
Precisely engineered of finest quality high speed tool steel for use on almost every material. The BURR-BIT is used by many large and small manufacturers throughout the country.

For full information and specifications on the BURR-BIT, write to
VERNON DEVICES, Inc.
481 E. 3rd Street Mt. Vernon, N.Y. MOunt Vernon 4-1686

CIRCLE INFORM-A-GRAM KEY NO. 1693

ALEXANDER DIE-SINKERS

for 2 or 3 dimensional work



Latest model, No. 3A for molds and dies up to 1000 lbs. Ratios from 1.5:1 to 10:1, 14 spindle speeds from 475 to 9500 rpm, cutters up to ⅜" dia. Two smaller sizes, 1A and 2A.

Get a close look at Alexander engravers, die-sinkers, and cutter grinders — optical dividing head, centering and cutter grinder microscopes, cylinder roller attachments and other accessories. Write for catalog B on these quality, British machines.

J. ARTHUR DEAKIN & SON 150-28 HILLSIDE AVE. JAMAICA 32, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1694

NOW GET CLEAN SURFACED PARTS FROM YOUR AUTOMATICS ... *UNMARRED* BY TOOL WITHDRAWAL MARKS

***THE NEW* RELIEVOMATIC**
SELF-RELIEVING TOOL HOLDER
SAVES YOU COSTLY SECONDARY FINISHING OPERATIONS

Avoid scratches like this

All clear with "Relievomatic!"

Easily installed on cross-slide or turret

Write today for details.

SILBER PRODUCTS, INC. Nightingale 9-8600
870 Essex Street • Brooklyn 8, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1695

MAYLINE

Facts About Mayline Drafting Tables

Both the wood base and the steel base 4-Post tables come equipped with a 3-way electrical outlet. Mounting is at either end, as the situation may require.

Drawers in the steel base table roll quietly and smoothly on muffled ball bearing rollers, contributing to the quiet atmosphere of the drafting room.

When in need of drafting room furniture, buy Mayline. You'll receive the best. See your dealer today.

Mayline Company
635 No. Commerce St.
Sheboygan, Wisconsin

MAYLINE

MAYLINE MAYLINE

CIRCLE INFORM-A-GRAM KEY NO. 1701

DEKA BORE

OFFSET BORING HEADS

UNPARALLED
- ACCURACY
- RIGIDITY
- SIMPLICITY
- DURABILITY

REPEAT TO .0001" IN 30 SECONDS WITHOUT BACKLASH! CAN BE ADAPTED TO FIT ANY MACHINE

100% GUARANTEED! WRITE FOR CATALOG!

PRECISION

PRECISION TOOL & MFG. CO. of ILLINOIS
1305 SOUTH LARAMIE AVE., CICERO 50, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1703

FOR PRECISION PRODUCTION

AIRLOX

TM REG. U.S. PAT. OFF.

MULTI-PURPOSE VISES

AIR OR HYDRAULIC

Type S-7 Illustrated

90 ti. air line pres. 5¼" x 8⅜" x 22¾" Max. jaw opening 5⅜".

ADAPTABLE AS POWER JIG OR FIXTURE OR SHORT STROKE BENCH PRESS

AIRLOX vises are precision built tools powered by specially engineered air or hydraulic cylinders. They can be operated manually or synchronized with the movement of a milling machine table or drill press spindle. They can be furnished in sets if desired so that the same tolerance is held between the base cross keyway and fixed jaw casting face on each vise.

AIRLOX patented wedge-&-lever action utilizes total cylinder drive, providing positive rigid grip on the work, exceptionally suited to carbide milling and almost all other milling operations.

Write for descriptive literature

production devices incorporated

Whitehall, N. Y. - - phone 40

CIRCLE INFORM-A-GRAM KEY NO. 1702

FREE! LATEST DATA!

how to improve **machinery control** with **sperry hydraulic remote controls!**

You will find this new bulletin crammed with helpful information! Sperry Hydraulic Remote Controls are available in standard and special types for use with feed, valve, throttle, governor, variable speed and clutch controls.

For your copy, just clip this ad to your letterhead, sign your name and mail to:

Sperry **SPERRY PRODUCTS, INC.**

402 Shelter Rock Road, Danbury, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1704

MEN YOU SHOULD KNOW

Theodore G. Vickers has been named plant manager of the Ross Operating Valve Co.

•

New executive vice president of Latrobe Steel Co. is **J. E. Workman.**

•

Two appointments were made in Chrysler Corporation's Stamping Division recently. **William G. Martin** was named divisional industrial engineer, and **Charles C. Mezey,** plant manager of the Nine Mile Press Plant. Martin will coordinate industrial engineering activities of the plants in the Stamping Division.

•

Election of **Edward H. Fisher** as president of Tube Reducing Corp. has been announced.

•

Henry G. Evans, general works manager of the Roemer Works, Farrell, Pa., has been promoted to general manager of operations for Sharon Steel Corporation. **William A. Horning,** assistant general works manager, is now general works manager of the plant.

•

F. J. Stokes Corp. has appointed **Walter W. Goehring** manager of the manufacturing department.

•

The appointment of **C. Harold Hannan** as senior application engineer at Miniature Precision Bearings, Inc., has been announced by the company. Hannan will be responsible for design and utilization of miniature bearings for a wide variety of miniaturization applications.

•

Manager of Ford Motor Company's Lima, Ohio, engine plant is **Clinton D. York.** York, former production manager at the Lima plant, replaces **C. S. Tennant,** who has been appointed manager of Ford's Engine Plant No. 1 in Cleveland.

•

Chief metallurgist for the Mackintosh-Hemphill Division of E. W. Bliss Co. is **Edward P. Sandbach.** He replaces **Charles E. Peterson** who has been named manager of manufacturing operations for the division's two Pittsburgh area plants.

•

Lloyd Lee has taken over as director of Automation for LeMaire Tool & Mfg. Co.

Electro Refractories & Abrasives Corp. has announced the election of **Carl F. Leitten** as president and chief executive officer. He succeeds **Grant S. Diamond,** who has become chairman of the board.

•

John W. Spoor has been appointed vice president and director of sales of Seaman-Andwall Corp., a division of American-Marietta Co. **Jack E. Davis** is now vice president in charge of operations and **Michael D'Amato,** vice president in charge of engineering.

The board of directors of The Federal Machine and Welder Co. has elected **J. R. Bearfoot,** president. He replaces **A. S. Blagden,** who was elected to the newly created post of chairman of the board of directors.

•

The appointment of **Gerald M. Henriksen** as director of engineering has been announced by Accoustica Associates, Inc.

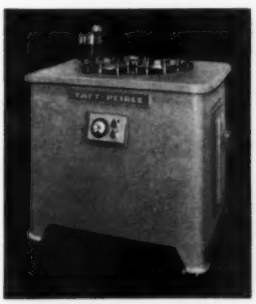
•

Airtronics International Corp. has appointed **Robert J. Brown** plant manager.

. . . *Continued on page 173*

Lapping 18 disc faces simultaneously, using inexpensive masonite separators mounted within 9" ID truing rings.

Now! Production Lapping with Flatness within One Lightband (.000011")



Delivery from stock! Machine furnished complete as shown with variable speed motor, compound tank with flexible tube, truing rings, and masonite blanks for making your own separators.

New Taft-Peirce Semi-Automatic Lapping Machine delivers flatness within one lightband (.000011") and finish as low as 1 micro-inch RMS.

Taft-Peirce has developed this new 24" production-type Lapping Machine to provide a faster, more accurate method of generating true contact surfaces and low micro-inch finish.

Simple to set up — easy to use. Mount work-pieces in holding fixtures, set desired time cycle and the machine does the rest. Lapping compound is fed automatically and timer shuts off both machine and coolant flow at end of cycle. Inexperienced operators can be trained in minutes to supervise one or a complete battery, as needed.

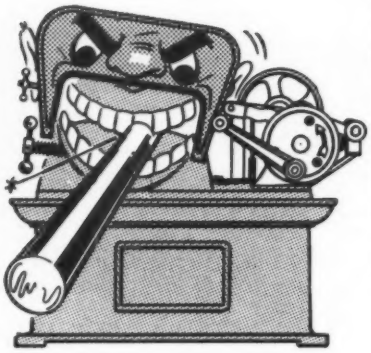
Act now to cut production lapping costs!

The new "semi-automatic" is inexpensive to buy, features low-cost operation and maintenance. Write for Bulletin MT-002 or contact your nearest Taft-Peirce agent.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

CIRCLE INFORM-A-GRAM KEY NO. 171



New Bite for POWER HACK SAWS

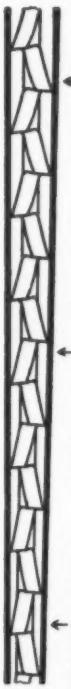
WITH

GUILLOTINE

DuWELD® PRO-SET

TRADE MARK

POWER BLADES



• Guillotine DuWeld Pro-Set Power Blades feature a completely new concept in sawing.

Teeth and gullet capacities are identical in size but the amount of set increases in infinite degrees from starting to finishing ends of the blade. Impact at start of stroke is reduced 50%.

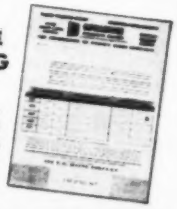
Metal is gradually and smoothly displaced instead of being "hogged" out. Chip load per tooth is greatly reduced.

Progressive cutting action is constant regardless of size of work piece. Every tooth is a working tooth resulting in 33⅓% more cutting action.

The chips are the proof. The tightly curled chips, generated by DuWeld Pro-Set Blades, are extremely elongated triangles when examined under glass, showing the progressive tooth loading action.

SEND FOR FREE BLADE TENSIONING CHART —

DESCRIBES THE NEW SIMPLIFIED *COUNTED TURN* METHOD. ELIMINATES GIMMICKS AND GADGETS.



WACHS CHICAGO

POWER BLADE DIVISION

THE E. H. WACHS CO.

1525 North Dayton St., Chicago 22, Ill.

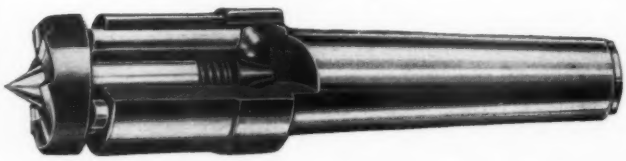
Phone Michigan 2-4650

CIRCLE INFORM-A-GRAM KEY NO. 1721

Cut production cost up to 30% with the new R. B. Precision Driving Center

On all Production Turning and Grinding Operations between centers our new DRIVING CENTER eliminates the use of a lathedog.

- Machine need not be stopped between workpieces.
- Entire length of workpiece can be machined in one pass.
- Eliminates whip, vibration, chatter and accidents caused by driving dogs.
- .0002" maximum run-out.
- Available from stock in 5 low sizes with Morse Taper Shanks 2 to 6 to hold any part from 9/16" diam. up.



R. B. TOOL CO., INC. 785 NORTH BROADWAY WHITE PLAINS, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1722

DYKEM STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
With DYKEM Steel Blue
Without DYKEM Steel Blue

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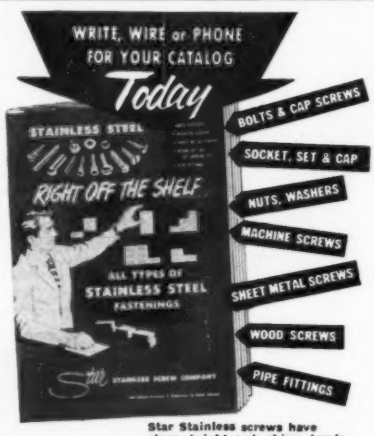


Star Stainless screws have clean—bright and—shiny—heads

STAR STAINLESS SCREW CO.

679 Union Blvd., Paterson 2, N. J.

Telephone: CLifford 6-2300
Direct N. Y. Phone: WI 7-9041
Direct Phila. Phone: WA 5-3660

CORROSION RESISTANT

CIRCLE INFORM-A-GRAM KEY NO. 1724

OPTICAL TANGENT ANGLE AND RADIUS DRESSER

- SEE THE GRINDING WHEEL AND DIAMOND MAGNIFIED THROUGH THE SPINDLE HOLE
- SET THE RADIUS WITH GAGE BLOCKS
- SET ANGLES AND ANGLE STOPS WITH ONE DEGREE VERNIER MARKINGS OR ON A SINE PLATE
- PROVEN AND ACCEPTED BY BOTH LARGE AND SMALL COMPANIES

DRESSER PRICE $285.00

EDGE FINDERS & VISE STOPS

Dealer Inquiries Invited

GLOVER MFG. CO.

422 Park Ave. Meadville, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1725

... Men from page 171

The appointment of **Walter Schmidt** as vice president of engineering for The O. A. Sutton Corp., Inc. has been revealed.

•

Frank A. Palmer, president of The Carpenter Steel Co., has been named president of the company's newly acquired Northeastern Steel Corp. Other officers include **John Moxon,** executive vice president; **Arlington A. Britton, Jr.,** vice president of production; **H. Sturgis Potter,** vice president of sales; **Dr. Carl B. Post,** vice president and technical director; **Willard E. Roberts,** secretary and treasurer; **Oliver May,** assistant treasurer and assistant secretary; and **William Bouton,** controller.

•

Graflex, Inc., has announced the appointment of **Barry Passman** as director of engineering. He will be in charge of the engineering and development program.

•

Stuart W. Tisdale has been elected president of the Southworth Machine Co. by the board of directors. Other officers include **George F. Thurber, Jr.,** and **H. Theodore Hawkes,** vice presidents; **Robert D. Brace,** secretary; and **John W. Jackson,** treasurer. In addition, **Thomas S. Dyer** was appointed production manager, and **Gordon Braun,** shop superintendent.

•

New manager of technical service at Dana Corporation's Toledo, Ohio, plant is **Ivan Calicoat.** He was formerly manager of Aircraft Gear Plant and will now be responsible for coordination between the manufacturing and engineering divisions in all matters affecting the quality of Dana products.

•

The board of directors for Micromatic Hone Corp. announces the election of **Kirke W. Connor** as chairman of the board and **Don S. Connor** as president and general manager.

•

Appointment of **George Gallousis** as patents and standards engineer has been announced by Allis-Chalmers Pittsburgh Works. He succeeds **William H. Mutschler,** recently named chief engineer. Gallousis served as engineer in the instrument transformer section at Pittsburgh Works, where he played a major part in the development of a line of epoxy resin molded instrument transformers.

Dr. Erwin G. Loewen has been appointed technical director, and **Franklin Meyer, Jr.,** assistant manager, of the Small Tool and Gage Division, for the Taft-Peirce Mfg. Co. Formerly staff engineer and director of machine tool production, Dr. Loewen will assume responsibility for an overall plant quality control policy. Mr. Meyer, also manager of the Instrument Gage Division, will work with matters of production organization.

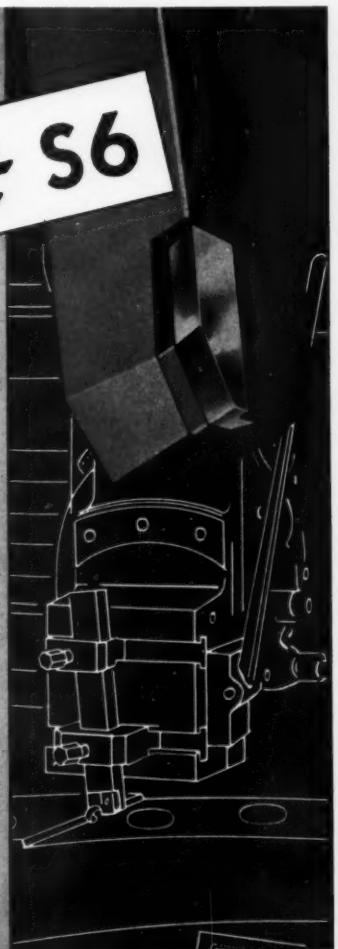
New chief engineers of Link-Belt Company's Pershing Road and Caldwell Plants are **Ralph C. McMillan,** former assistant chief engineer of the Pershing Road Plant, and **David A. Davis,** former divisional engineer of the Pershing Road Plant, respectively.

Your Inform-A-Gram Card Follows Page 162 In This Issue.

There's NO Equivalent—

Coromant S6

SANDVIK To Coromant's New Shock-Resistant CARBIDE Grade S-6



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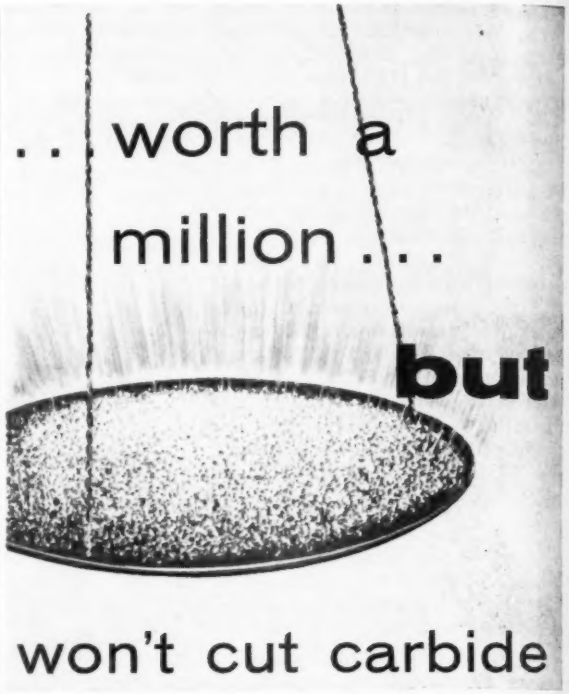

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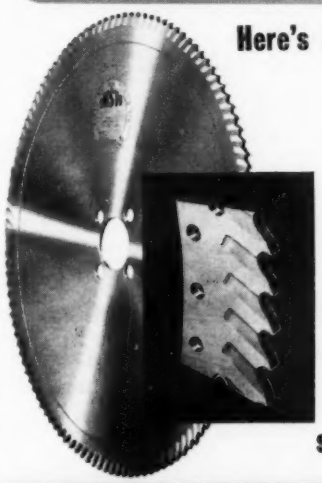

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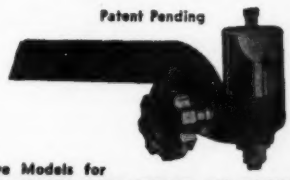

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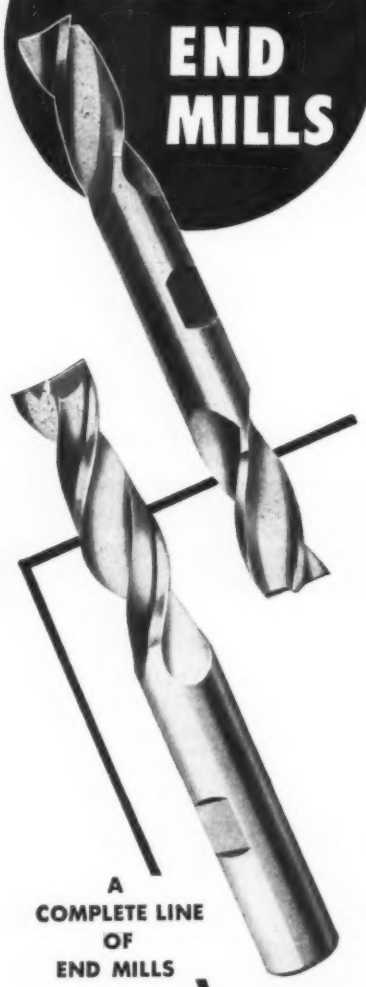

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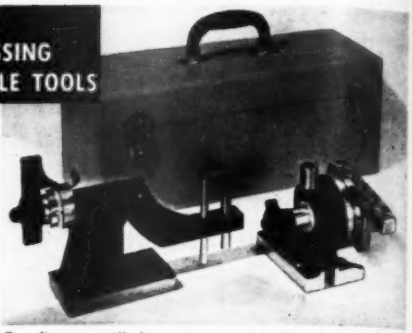

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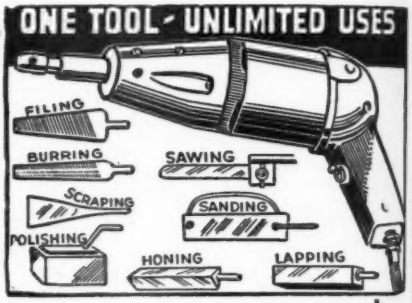

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